

**Literature review of the most cited articles in selected 5 educational technology journals during 2013 to 2017 – Identifying the champions**

**Author: Dr. Basanta Pd Adhikari**

**Research Head OXFORD COLLEGE OF ENGINEERING AND MANAGEMENT,  
GAINDAKOT-2 NAWALPARASI, NEPAL**

## **Abstract**

The aim of the current research was to examine the characteristics of the most cited articles, derived from per five journals and per year among the five selected journals between 2013 to 2017. The research method of this study was the review of the most cited published articles. The results indicate that the most cited published article was entitled “The gamifying learning experiences” which was cited 801 times. The results further indicate that three articles were derived from the journal of CE but remaining four articles were derived from the JETRD, JCAL, LEE TLT, and BJET among the seven most cited articles. The results further conclude that five articles were published in 2013 and other two articles were published in 2014 and 2015. A mixed methods design, review of the empirical articles and quantitative design were applied in the most cited seven articles as the research method. The primary implication of findings is the issue of generalization because of the limited number of reviewed most cited published articles in the current study. It is concluded that the journal of CE was found dominating in the field of educational technology research in all years.

**Keywords:** Characterizes, educational technology, most cited articles

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## 1 INTRODUCTION

Reviewing published most cited articles is one of the primary tasks for the novice researchers. The research findings can be not only recognized in the academic community but also be beneficial for applying tenure, promotion, grants and scholar awards by the publications to advance their professional careers. Similarly, education researchers often view the publications of research findings in academic journals as a significant work for their professional development (Tsai & Lydia Wen, 2005). More importantly, reviewing most cited published educational technology journals help the novice researchers to understand the required field in greater depth. Educators can be supported by the systematic analysis of the most cited published articles in academic journals to discover the current status and future trends of educational technology research (Lee, Wu & Tsai, 2009). Various methods have been used to review different empirical published most cited articles. Reviewing journal articles is also regarded a key effort to find the most debatable and emergent issue of educational technology research in the current educational context. Review of journal articles is also embedded in selecting a new research topic for further investigation. In the current study, the aim of the analysis was to identify the most cited articles in educational technology between 2013 to 2017. The five selected journals were entitled “British Journal of Educational Technology (BJET), the Journal of Computer and Education (CE), the Journal of Computer Assisted Learning (JCAL), the Journal of IEEE Transactions on Learning Technologies (IEEE TLT) and the Journal of Educational Technology Research and Development (JETRD).

The method of reviewing the most cited published articles was content analysis method where selected most cited published articles were compared and summarized on the basis of the citation counts, published years, titles of the published articles and existing theories. The current era of education is embedded in worldwide educational systems which demands for the holistic research in the educational technology to support the learners and teachers (Pathek & Chaudhay, 2012). Many changes have been globally taken place in the political, economic and demographical sectors which also demand the systematic research on the emergence of educational technologies in teaching and learning activities. Furthermore, the research on educational technology has covered, for example, the issues of social media, serious games, and adaptive software to improve the outcomes of education. Similarly, the emerging practices on openness and user modelling have to be focused in future research because global education has demanded the innovations and new practices in digital learning contexts which have been facing complexities and unavailable technological resources in

teaching and learning activities (Pathek & Chaudhay, 2012). The roles of educational technology have been increasing day by day in the educational sector for the improvement of the students' achievements and educational quality. So, the review of most cited published articles is emerging to focus on the current demands of educational technology and its integration in educational institutions (Tondeur, van Braak, Siddiq & Scherer, 2016). The outcomes of education will be fruitful for all nations if computer and technological tools are integrated in their educational system. More importantly, this is the era of Information and Communication Technology (ICT) where all official and none-official works, private and public activities have been made so convenient. So, current educational leaders and practitioners have to at least understand the importance of ICT for effective and efficient teaching and learning activities (Onifade, 2011).

### **1.1 Meaning of educational technology**

The word educational technology was initially used in early 1960 in Educational Technology Magazine by Lawrence Lipsitz. It is difficult to find out the definition of educational technology, but many researchers have used educational technology for linking education and technology research (Integrating technology in the classroom, 1999). Spector (2015) states that; "Educational technology involves the disciplined application of knowledge for the purpose of improving learning, instruction, and/or performance" (p.10). The word educational technology is the combination of both education and technology. The word educational technology was initially used separately as education and technology and was used later jointly as educational technology. More importantly, the study and ethical practice of supporting learning and improving performance by generating, using and managing suitable technological processes and resources is regarded as an emerging educational technology (Williams, 2012).

This is an era of digital education where the role of teachers to use educational technology in teaching and learning activities is imperative. Our teachers are expected to adequately use technology in their educational practices. Many researchers, research institutions and scholars have been engaging how technology can be used in educational practices to achieve desired outcomes of our education (Tondeur et al., 2016). The current demands of education is directly affected by the integration of digital technology and educational activities. Online library, Web learning, Moodle, Weboodi, Online examination system, Digital Media and the availability of in-house face-to-face training sessions are deeply rooted in education technology. On the other hand, spending time to improve

students' skills and knowledge and using online resources will help them to find the right information for their studies quickly. It will also help them to achieve excellent results in the final exam (Antonenko, Dawson & Sahay, 2016). The concept of educational technology should begin with the discussion of the learner and teacher demands that should address their needs and assessment method. It also involves in the process of interviewing the target users. Regrettably, many educational technology innovators neither collect and analyse the data for the demands of the learners and teachers nor consider empirical evidence related to the target population of educational practitioners (Pathek & Chaudhay, 2012).

Educational technology has to infuse in the entire curriculum of learning activities to support both teachers and students in order to improve educational standard and educational accessibility for all (Pathek & Chaudhay, 2012). The study and ethical practice of supporting teaching and learning activities and improving the performance of learners by using and managing the approach technology processes in education is highly demanding now (Gupta, 2015). In other words, educational technology is embedded in the simplification of human learning through systematic identification, development, organization and use of a full-range of teaching and learning resources as well as managing the required resources (Feller, 2014). It is concluded that education and technology are two interconnected phenomena which cannot work in the absence of one or the other. It is also believed that education and technology can strongly support to improve the educational outcomes (Brun & Hinostroza, 2014). "Information and Communications Technology (ICT) has gone through innovations and transformed our society that has totally changed the way people think, work and live now. As part of this, schools and other educational institutions which are supposed to prepare students to live in "a knowledge society" need to consider ICT integration in their institutional curriculum" (Ghavifekr, Zabidi Abd Razak, Faizal, Ng Yan Ran, Meixi, & Tengyue, 2014, p.1). The published articles on Computer and Education have significantly focused on the use of computer and its applications as an educational technologies to meet the global digital demands of education (Picatoste, Pérez-Ortiz & Ruesga-Benito, 2018).

### **1.1.1 Relationship between, computer and education**

Computer and education are two familiar words in teaching and learning activities all over the world. Due to the rapid development of digital education, the role of computer in educational institutions is unavoidable and essential. It is considered that two natural goals for the designer of the educational software are information and communication technology. The mission of the software could be to teach students in such a way that they grow their knowledge without bound, never forgetting anything along the way and a sort of “lifelong learning approach to education” (Novikoff, 2012). Computer support learning in real-world contexts, for example, with inquiry projects that allow students to collect scientific data in the natural environment, connects learners to experts and communities of other learners. It also provides tools to improve learning for the students. For example, visualization and analysis tools allow students to apply complex data for higher order thinking which provides opportunities for feedback, reflection, and revision in the attainment and creation of knowledge (Novikoff, 2012). The computer support learning also connects the intelligent tutoring systems and expands opportunities for teachers to learn, and to use different teaching methods. Online communities practice and best-practice case studies are two examples of computer support learning technology (Peters, 2009). Again, electronic devices, for example, mobiles, computer and other devices have revolutionized the global education systems in many ways. For example, schools today are willing to equip classroom and labs with computers for each student to improve their learning capacity. More importantly, online text books, magnetizes and online journal articles are perfectly connected between computer and education (Novikoff, 2012).

Picatoste, Pérez-Ortiz & Ruesga-Benito (2018) state that; “From the eighteenth century, the industrial revolution, radically transformed life at a planetary level. The three phases of the industrial revolution were continued with the fourth revolution” (p. 1032). It is true that rapid changes had taken place in industrial equipment after the industrial revolution which eventually emerged the new technology in educational sector as well (Spector, 2017). The empirical study also reveals that three phases of industrial revolution had direct impacts on the current demands of education because there is close relationship between advanced technology and education practices (Spector, 2017). Globalization was derived from the rapid revolution of the digital and information communication technology which have made everything possible and captured the whole world in a personal computer. So, it is the time to link the teaching activities with the application of computer so that it can enhance the outcomes of education, better students’ understanding and better outcomes of educational investment. It is also imperative to link our teaching and learning activities with

computer technology which makes the teaching processes easier and better understandable (Compton & Compton, 2011). Final conclusion can be drawn that the global demand of education has been emerged for the use of computer in education which should go jointly to enhance the educational outcomes. In the absence of one, another will be worthless for effective and productive teaching and learning achievements (Brun & Hinostroza, 2014).

### **1.1.2 Importance of technology in classroom teaching and learning activities**

The current era of education is more likely emerging to connect with educational technology research because teacher educators are still struggling with how to create positive, interactive, open learning environment in educational institutions. Creating a powerful learning experiences is one step ahead to transform teachers' efforts into classroom practice (Putnam & Borko, 2000). The roles of technology in education has been emerged since two decades ago because the use of education technology can identify the demands of students, enriches teachers how to apply technology in instructions and also helps for tracking their performance (Onifade, 2011). Additionally, educational technology can enhance students' performance, keep students engage effectively in learning activities, improve students' performance and make students' response to adapt the new learning environment (Spector, 2017).

Van Thiel (2018) states that “Technology integration in schools involves implementation of computers for effective and efficient use in meaningful curriculum-driven ways that enhance student learning by allowing for flexibility, creativity and collaboration, while making real-world connections” (p.2). Educational technology is important for teaching and learning activities because it integrates computer and teaching activities for the easy understanding of the contents. It also enhances teachers' teaching skills and makes them easy to manage their classroom (Onifade, 2011). The use of technology in classroom teaching can support teachers for effective and efficient use of curriculum contents which can increase student achievements. The use of technology also enhances teachers' beliefs for external commands and opportunities and permits them to access for resources (Christensen et al., 2018). They further state that “Technology in education is an integral part of effective teaching and learning. It is crucial to prepare learning leaders who can guide and support innovative and effective technology enhanced learning in the classroom” (p.458). Educational technology also supports students and teachers to improve their performance; how to manage

classroom activities effectively and efficiently, and how to motivate students during the classroom teaching (Alexander, 2018).

Gupta (2015) states that; “The field of education has been affected by the penetrating influence of information and communication technology. Undoubtedly, ICT has impacted on the quality and quantity of teaching, learning, and research in traditional and distance education institutions” (p.316). It is noted that current educational systems and teaching and learning practices have been positively influenced by the facilities of ICT for delivering actual chances for individualized instruction in classroom teaching (Cuny, 2011). It also enhances the capability of accelerating, inspiring, and deepening skills; motivating and engaging students in teaching and learning activities. Technology is also useful to teachers for helping to relate school experiences to work practices; creating economic viability for tomorrow’s workforces; underwriting to fundamental changes in schools; strengthening teaching and providing opportunities for the connection between the schools and the societies (Onifade, 2011).

## **1.2 Research questions of the current study**

The primary research question is related to identifying and analyzing the most cited articles based on per five journals and per year among the five selected journals in the field of educational technology during the year 2013 to 2017.

The primary research question has been divided into three sub-questions.

What are the characteristics differences between the most cited articles per five selected journals?

What are the characteristics differences between the most cited articles per year among the five selected journals between 2013 to 2017?

What are the differences between the most cited articles per five selected journals and per year among the five selected journals between 2013 to 2017?

At first, the most cited five journal articles were derived from Publish and Perish Tool. The British Journal of Educational Technology was the main source of academic journal articles for researchers and academicians in the arena of digital educational and training technology throughout the universe. The publications of BJET are deeply rooted in theoretical outlooks, methodological developments and high quality observed studies that signify whether and how applications of educational systems, tools, and resources guide to developments in both formal and informal education at all sectors (“British Journal of Educational Technology”, 2018).

The second journal was CE that is helpful to increase knowledge and understanding of different ways by using computer technologies in teaching and learning activities. More importantly, the journal of CE was also the main source of educational technology research. Additionally, it primarily focuses on digital technology in order to enhance educational practices through the publication of high quality research materials which eventually increases the level of the theory and practice of education. It is significantly noted that CE has highly demanded articles because it has revolutionarily increased the importance of research on Computer and Education all over the world (Robins, 2015). The third journal was JCAL. The word Computer Assisted Learning is embedded in the use of computers to support the education of people, to describe the application of computers and also includes the instructions for computer-based learning activities. Moreover, the meaning of JCAL is defined as an interactive instructional technique where a computer can remarkably present the instructional materials for teaching and learning activities (De Witte, Haelermans & Rogge, 2014). The fourth journal was IEEE TLT which is embedded in using technology in teaching and learning activities to improve the outcomes of education. In more details, learning technologies have been deeply rooted in computer-based learning method which is supported by the application of technology for the improvement of teaching methods. Furthermore, computer-based learning is directly linked in using the multimedia materials and also using of different networks and communication systems to assist learning activities (Innovation in Technologies for Educational Computing, 2016). The words equality, future, mobile, motivation, social, updates, assessments, global, and convenience have been used for the importance of learning technologies in educational sectors (2017 Index IEEE Transaction on Learning Technology Vol. 10, 2018). The fifth journal was the JETRD. The meaning of educational technology research and development is understood by a single scholarly journal focusing entirely on research and development in educational technology. The history of the existence of educational technology and its growth was likely to be placed on bibliographies of classic texts for master's degree students. The next origin of education technology was anticipated among working professionals, for example, technology coordinators, instructional designers, school library media specialists, training directors, and technology teachers (Januszewski, 2001).

### **1.3 Research method**

The purpose of the current study is to compare and contrast the 41 most cited articles per five selected journals and per year among the five selected journals (See in Appendix 1). Nine articles were found repeated during the article selection process. The current chapter has focused on the main research questions of the current study where one main research question and 3 sub-questions were designed to facilitate the analysis section. The primary research questions are rooted in the differences of citation counts; publication years of journals and the differences and contrasts of the key words used in the selected most cited forty-one articles. The next issue of the sub-research questions is deeply rooted in the variations of per five selection most cited journals and per year among the five selected most cited articles based on their characteristics. The current method section has mainly focused on the topics of per five selected journals and per year among the five selected journals of the forty-one published most cited articles between 2013 to 2017. The main research method of reviewing most cited forty-one articles is embedded in the content analysis. The forty-one most cited selected articles are presented in Pie Chart mentioning their citation counts, percentage and contents of the most cited articles in the given Pie Chart in each analysis section. Furthermore, forty-one articles are also mentioned in the tabulated form to make analysis section clear.

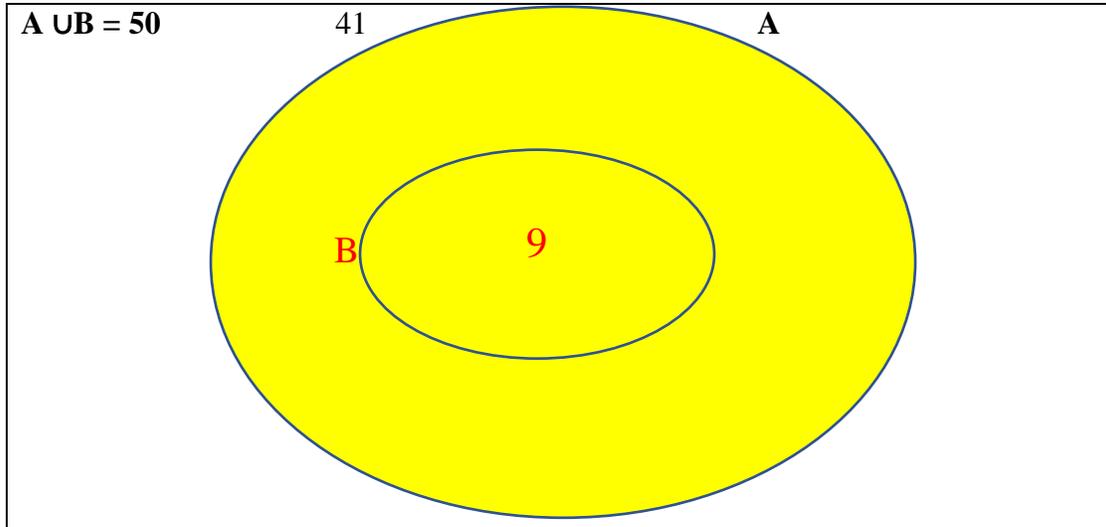
#### **1.4 Structure of the thesis**

Chapter two introduces the research design of the current thesis where the content analysis will focus on analyzing the data, for example, citation counts, publication years, contents of the most cited articles and the key words used in the forty-one selected articles. It also explores the methods of data analysis and key contents for the further analysis. The research design also focuses on different issues of data analysis. Similarly, chapter three introduces the results of the current thesis and further identifies and analyzes the key characteristics of the most cited articles based on per five selected journals and per year among the five selected journals. The results section further explores details analysis of 41 most cited articles based on the publication years, the key words of per five selected journals, citation counts and the percentage covered by each article in each Pie Chart. The fourth part of the current thesis introduces the discussion, recommendations and future work of the whole part of the thesis which also compares, contrasts and synthesizes the key findings of the results section.

## **2 RESEARCH DESIGN**

The purpose of the current research design was to analyze the most cited published articles per five selected journals and per year among the five selected journals between 2013 to 2017. The research design mainly focuses on the methods and contents of the most cited forty-one selected published articles. The contents for the analysis are abstracts, years of publication and citation counts, key words, research methods, research findings of the forty one most cited forty-one published articles. First of all, five journals entitled the BJET, CE, JCAL, IEEE TLT and JETRD were selected. The five most cited journals of CE, JCAL, BJET, IEEE TLT and JETRD were selected because they were found the high-ranking journals in the archive of educational technology research. One of the main reason is also based on the suggestion of the thesis supervisor for the selection of five selected journals. The personal interest of the current researcher was another reason for selecting per five selected journals.

The current study could not select more than five most cited per selected journals because of the timeframe of the current researcher. The next issue will explore the method of selecting per five journals and per year among the five selected journals. Initially, the search words were inserted into the home page of Scopus and later on verified by the citation counts of the google scholar's Publish and Perish Tool. After that the options of source title, cited by (highly) journal articles and limit year (2013 to 2017) were chosen and found the citation counts of the most cited five published articles in descending order. Similarly, five most cited published articles per years among the five selected journals were identified from the year of 2013, 2014, 2015, 2016 and 2017 respectively (See in the Table 1 and Table 2). Among fifty selected published articles, nine articles were found repeated in both selection criteria [Selection based on per five selected journals and selection based on per year among the five identified journals from 2013 to 2017]. Most of the repeated articles were derived from the journal of CE (n=5). Repeated articles are presented in a set builder form where "A" denotes all fifty articles from per five selected journals and "B" denotes repeated articles from all five selected five journals.



**Figure 1. Set Builder Notation of Nine Repeated Articles**

The center part “B” denotes the nine repeated articles (N = 9) and “A” denotes forty-one articles (n=41) for the further analysis. Nine repeated articles were excluded for the double further analysis in the analysis section.  $A \cup B$  denotes 50 articles per selected five journals and per year among the five selected journals between 2013 to 2017. Total 41 most cited published articles were finalized for the further analysis in the result section. The citation counts of 41 most cited published articles were taken on 20<sup>th</sup> May 2018. The number of citation counts might be more in the forthcoming day, but the current researcher does not consider the citation counts after 20<sup>th</sup> May 2018. In the current study, the research topics of each most cited published article have been embedded in different subjects and different areas of the educational and technology research. The selected most cited articles mentioned in the Table 1 and 2 have presented the total citation counts of each published article, published years and the name of five selected journals. There are five rows and five columns in the Table 1 and Table 2 where forty-one published most cited articles are mentioned as well.

### **3 RESULTS**

In the current study, forty-one most cited published articles between 2013 to 2017 were selected for the analysis which were derived from the BJET, CE, JCAL, IEEE TLT and JETRD. All the forty-one selected journal articles have been analyzed one by one on the basis of research type, published years, citation counts of the selected articles, and also on the basis of the key words used in different forty-one most cited published articles. The analysis is based on the all the published forty-one most cited articles in per five selected journals and per year among the five selected journals between 2013 to 2017. Again, the current study further recognized most cited published articles per year among the five selected journals and per five selected journals between 213 to 2017. All the selected forty-one published articles are compared among the year of 2013, 2014, 2015, 2016 and 2017 and also compared with per five selected journals of the BJET, CE, JCAL, IEEE TLT and JETRD (Cuny, 2011).

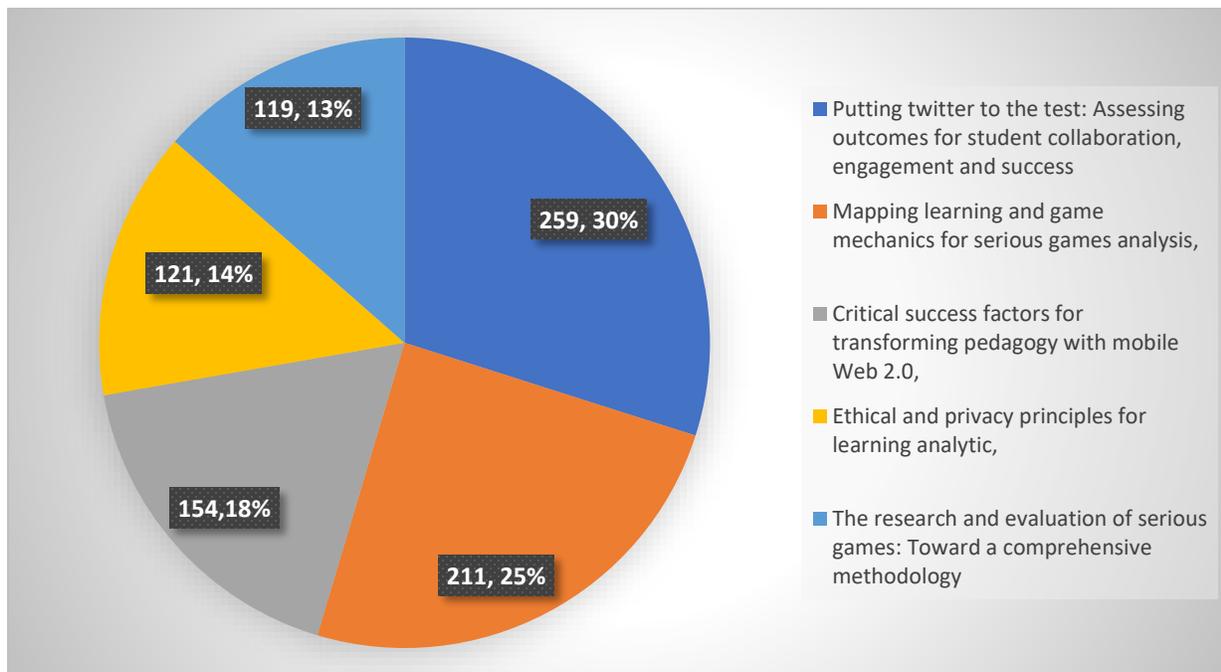
#### **3.1 Comparison of citation counts per five selected journals between 2013 to 2017**

Total forty-one published most cited articles, derived from five per selected journals and per year among the five selected journals are analyzed in the following sections. The analysis has mainly focused on the citation counts, published years of the forty-one published articles, name of the journal of each published article. Similarly, the most cited and least cited articles are also discussed in the analysis process. The primary key words of the forty-one published articles have also discussed in the result section.

##### **3.1.1. The five most cited published articles of BJET**

Firstly, five most cited published articles were chosen from BJET. The most cited article from BJET was entitled “Putting twitter to the test: Assessing outcomes for student collaboration, engagement and success”, published in the year of 2013 which was cited by 259 times in the empirical published articles (30%). Similarly, the second most cited published article from BJET, published in the year of 2015 was “Mapping learning and game mechanics for serious games analysis” which was cited 211 times by the empirical published articles (25%). The third most cited article published of BJET, published in the year of 2015 was entitled “The critical success factors for transforming pedagogy with mobile Web 2.0” which was cited 154 times by empirical published articles (18%). The fourth most cited article of BJET, published in the year of 2014 was entitled “The ethical and privacy

principles for learning analytics” which was cited 121 times by the empirical published articles (14%). The fifth most cited article from BJET, published in the year of 2014 was entitled “The research and evaluation of serious game” which was cited 119 times by the empirical published articles (13%).



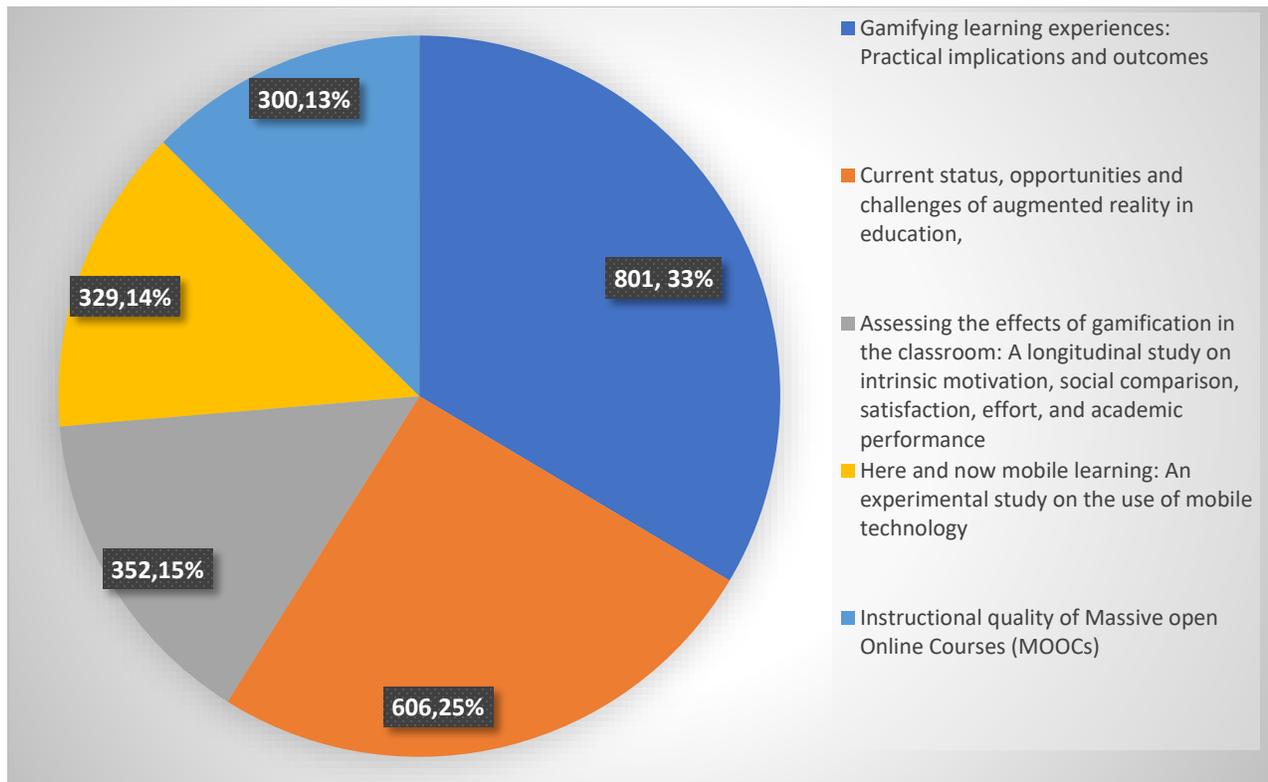
**Figure 2. Five most cited articles from BJET**

The Pie Chart in Figure 2 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles of BJET.

### 3.1.2 Five most cited published articles of CE

Secondly, the most cited article from the journal of CE was “Gamifying learning experiences: Practical implications and outcomes”, published in the year of 2013, was cited 801 times by the empirical published articles (33%). The second most cited article from CE, published in the year of 2013 “Current status, opportunities and challenges of augmented reality in education”, which was cited 606 times by different empirical published articles (25%). The third most cited article published from CE, published in the year of 2015 “Assessing the effects of gamification in the classroom” which was cited 352 times by the empirical published articles (15%). The fourth most cited article from the Computer and Education, published in the year of 2013 was “Here and now mobile learning” which was cited 329 times by the empirical published articles (14%). The fifth most cited

article from the CE, published in the year of 2015 was “Instructional quality of Massive Open Online Courses (MOOCs)” which was cited 300 times by the empirical published articles (13%).



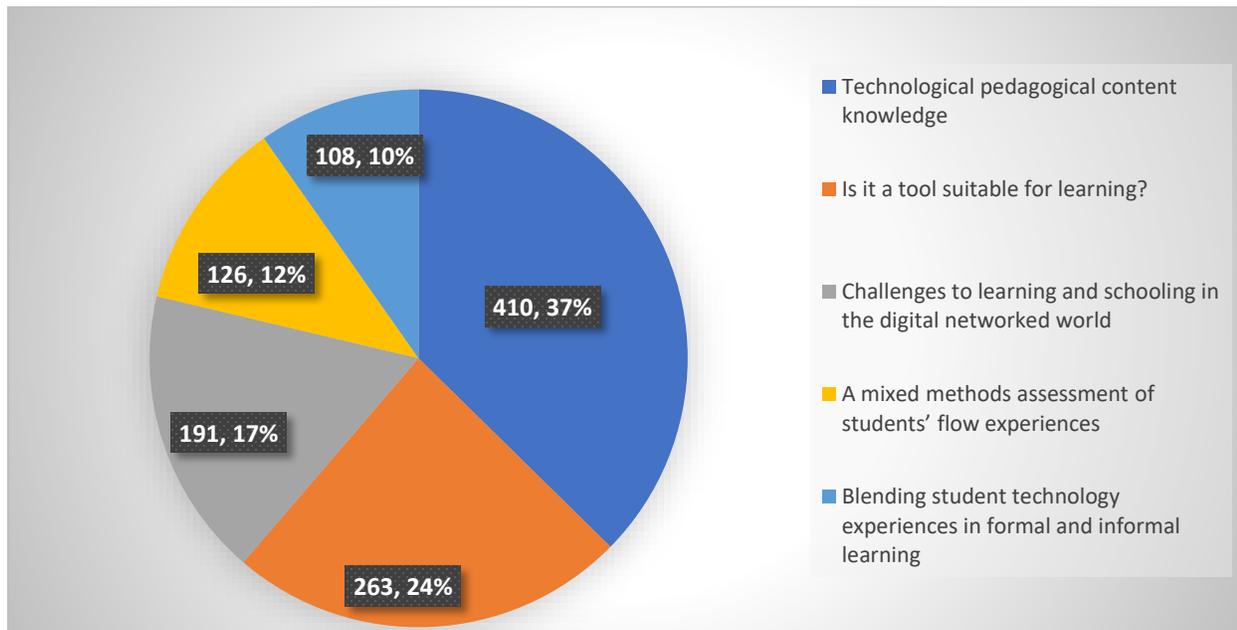
**Figure 3. Five most cited articles from CE**

The Pie Chart in Figure 3 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles of CE.

### 3.1.3 Five most cited published articles of JCAL

The Figure 4 shows that the most cited published article from the JCAL, published in the year of 2013 was “Technological pedagogical content knowledge” which was cited 410 times by the empirical published articles (37%). The second most cited journal article from the JCAL, published in the year of 2013 was “Is it a tool suitable for learning? A critical review of the literature on Facebook as a technology-enhanced learning environment”, cited 263 times by the empirical published articles (24%). The third most cited journal article, published in the year of 2013 was “Challenges to learning and schooling in the digital networked world of the 21st century”, cited 191 times by the different empirical published articles (17%). The fourth most cited article from the JCAL was “A mixed methods assessment of students’ flow experiences during a mobile augmented reality science game”, cited 126 times (12%). The fifth most cited article from the Computer Assisted

Learning, published in the year of 2013 was “Blending student technology experiences in formal and informal learning”, cited 108 times (10%).

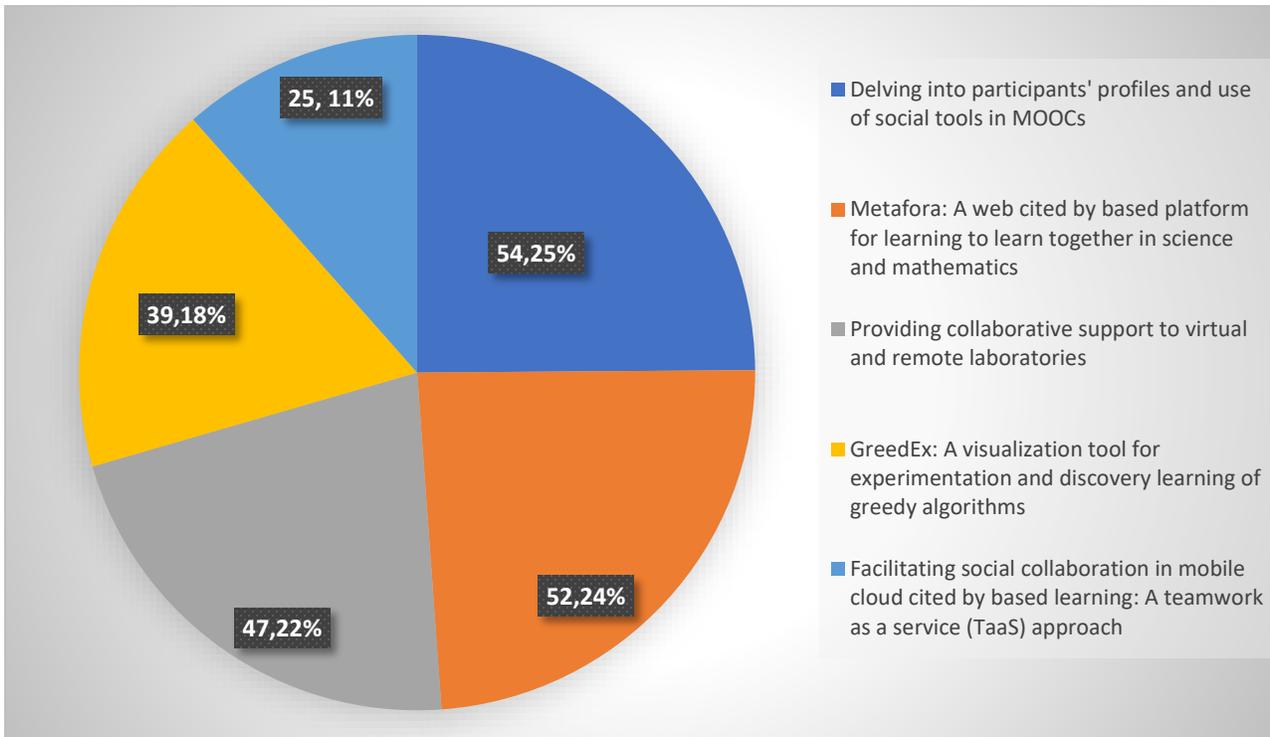


**Figure 4. Five most cited articles from JCAL**

The Pie Chart in Figure 4 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles of JCAL.

### 3.1.4 The five most cited published articles of IEEE TLT

The most cited journal article from the IEEE TLT, published in the year of 2014 was “Delving into participants' profiles and use of social tools in MOOCs”, cited 54 times by different empirical published articles (25%). The second most cited journal article from the IEEE TLT, published in the year of 2013, was “Metafora: A web-based platform for learning to learn together in science and mathematics” which was cited 52 times by the published articles (24%). The third most cited journal article, published in the year of 2013 from the IEEE TLT was “Providing collaborative support to virtual and remote laboratories”, cited 47 times (22%). The fourth most cited article from the IEEE TLT, published in the year of 2014 was “GreedEx: A visualization tool for experimentation and discovery learning of greedy algorithms”, cited 39 times (18%). The fifth most cited article from the IEEE TLT, published in the year of 2014 was “Facilitating social collaboration in mobile cloud-based learning” cited 25 times by the different empirical published articles (11%).

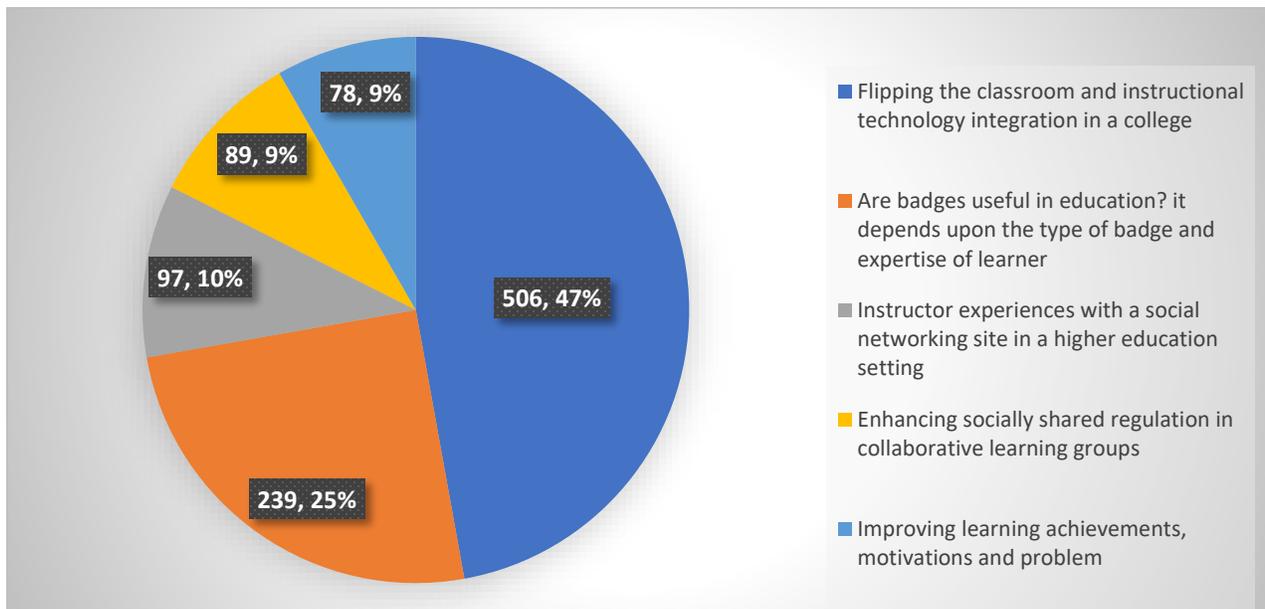


**Figure 5. Five most cited articles from IEEE TLT**

The Pie Chart in Figure 5 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles of IEEE TLT.

### 3.1.5 The five most cited articles of JETRD

The most cited article published on JETRD, published in the year of 2013 was “Flipping the classroom and instructional technology integration in a college-level information system spreadsheet course”, cited by 506 different empirical studies (47%). The second most cited article of the JETRD, published in the year of 2013 was “Are badges useful in education? It depends upon the type of badge and expertise of learner?” cited by 239 different empirical published articles (25%). The third most cited article of the JETRD, published in the year of 2013, was “Instructor experiences with a social networking site in a higher education setting: expectations, frustrations, appropriation, and compartmentalization”, cited by 97 different empirical published articles (10%). The fourth most cited article of the JETRD, published in the year of 2013, was “Enhancing socially shared regulation in collaborative learning group”, cited by 89 different empirical published articles (9%). The fifth most cited article of JETRD, published in the year of 20 14 was “Improving learning achievements, motivations and problem-solving skills through a peer assessment-based game development approach”, cited by 78 different empirical published articles (9%).



**Figure 6. Five most cited articles from JETRD**

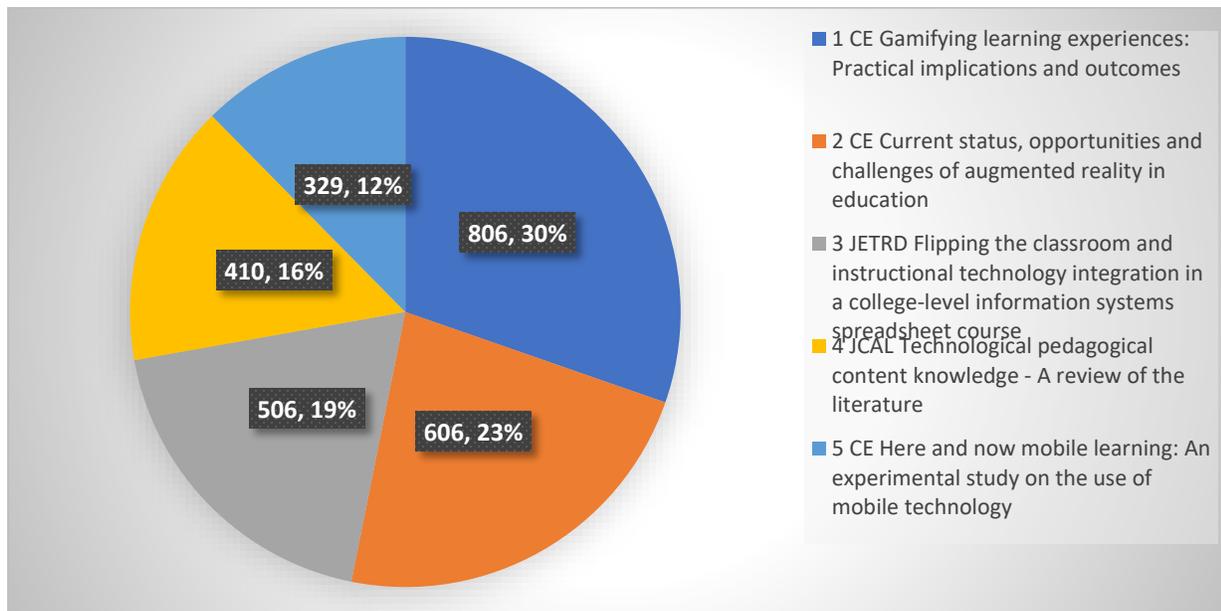
The Pie Chart in Figure 6 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles of JETRD.

### **3.2 Analysis of the five most cited published articles per year between 2013-2017**

The next step of the current study was to analyze most cited published journal articles based on per year among the five selected journals between 2013 to 2017.

#### **3.2.1 The five most cited articles published in 2013**

The most cited article published in the year of 2013 was “Gamifying learning experiences: Practical implications and outcomes” which was cited by 801 different empirical published articles (31%). The second most cited published paper, published in the year of 2013 was “Current status, opportunities and challenges of augmented reality in education” which was cited by 606 different empirical studies (23%). The third most cited article published in the year of 2013 was “Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course” which was cited by 506 different published articles (19%). The fourth most cited article published in the year of 2013 was “Technological pedagogical content knowledge” cited by 410 different published articles (14%). Finally, the fifth most cited article published in the year of 2013 was “Here and now mobile learning, which was cited by 329 different empirical published articles (13 %).

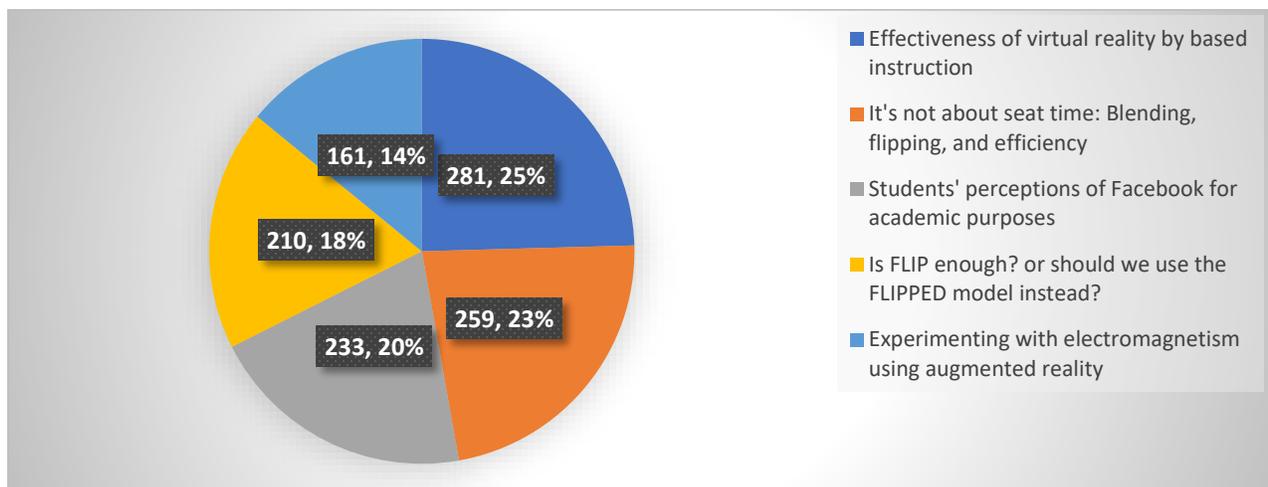


**Figure 7. Five most cited articles in 2013**

The Pie Chart in Figure 7 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles published in the year 2013.

### **3.2.2 The five most cited published articles in 2014**

The most cited paper published in the year of 2014, derived from CE was “Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education” which was cited by 281 different empirical published articles (25%). The second most cited article, published in 2014 was also derived from the journal of CE which was “It’s not about seat time: Blending, flipping, and efficiency in active learning classrooms” which was cited by 259 different empirical published articles (23%). The third most cited article was derived from the journal of CE which was “Students' perceptions of Facebook for academic purposes”, cited by 233 different empirical published articles (20%). The fourth most cited article published in 2014 was derived from the journal of CE was “Is FLIP enough? Or should we use the FLIPPED model instead”, cited by the 210 different published articles (18%). The fifth most cited article published in 2014 from the journal of CE, “Experimenting with electromagnetism using augmented reality: Impact on flow student experience and educational effectiveness” which was cited by 159 different published studies (14%).

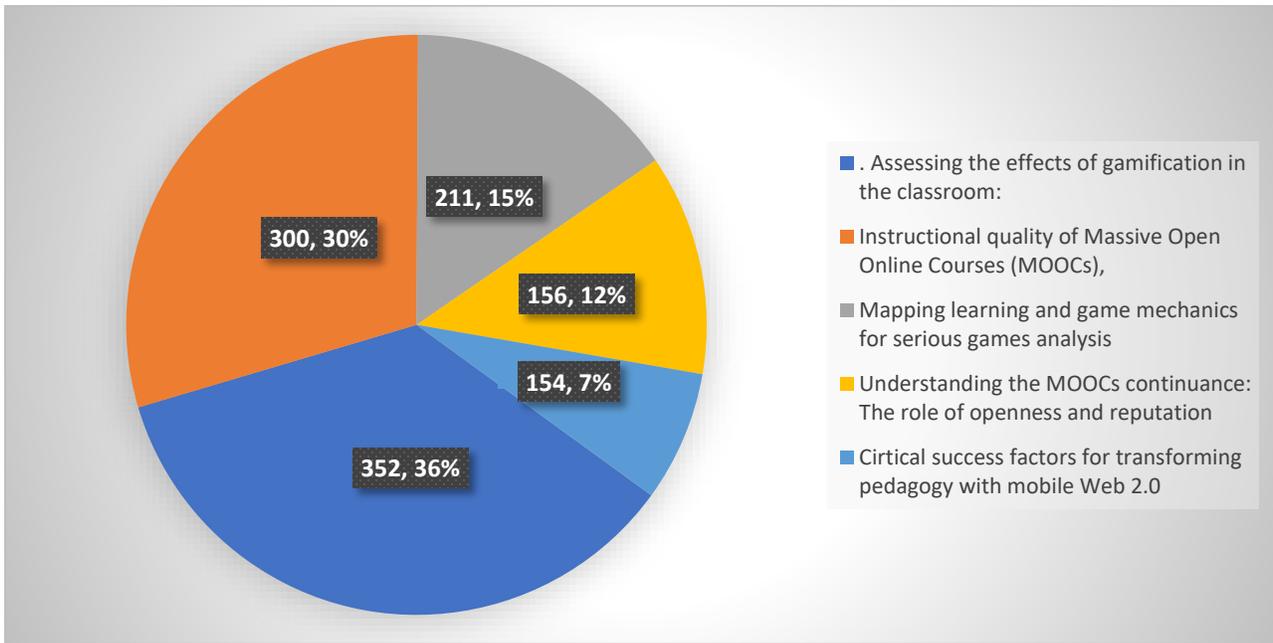


**Figure 8. The five most cited articles in 2014**

The Pie Chart in Figure 8 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles published in the year of 2014. The analysis results concluded that the journal of CE has been recognized the journal consisting the most cited journal among the per five selected journals and has raised the hot issues of educational technology internationally so that future research would be reflected to focus on the emergence of using technology in teaching and learning curriculum contents to enhance education quality (Hanus & Fox, 2015).

### **3.2.3 The five most cited published articles in 2015**

The most cited article published in the year of 2015 was from the journal of CE which was “Assessing the effects of gamification in the classroom”, cited by 352 different empirical published articles (36%). The second most cited published article, published in 2015 was derived from the journal of CE “Instructional quality of Massive Open Online Courses”, and cited by 300 different empirical published articles (30%). The third most cited article derived from the BJET was “Mapping learning and game mechanics for serious games analysis”, cited by 211 different empirical published articles (15%). The fourth most cited article published in 2015 was derived from the journal of CE “Understanding the MOOCs continuance”, cited by 156 different empirical published articles (12%). The fifth most cited article published in 2015 from BJET, “Facebook and the others. Potentials and obstacles of Social Media for teaching in higher education”, cited by 154 different empirical published articles (7%).

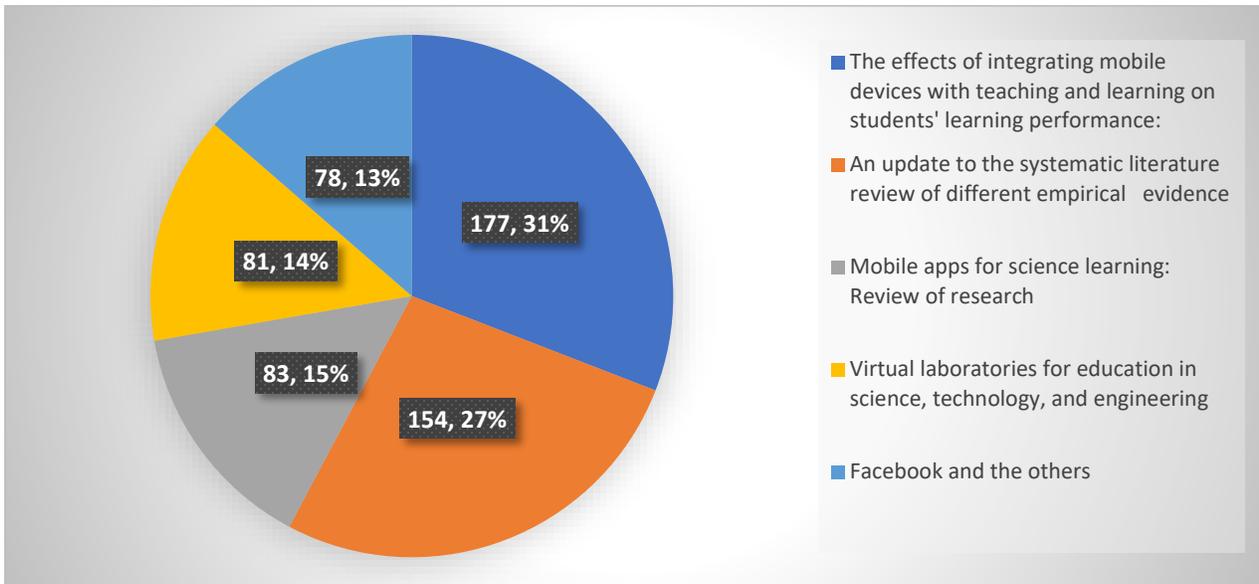


**Figure 9. Five most cited articles in 2015**

The Pie Chart in Figure 9 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles published in the year 2015. Also in 2015 CE journal is dominating.

### 3.2.4 The five most cited published articles in 2016

The most cited published paper published in 2016 was “The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis”, cited 177 (31%) times by the different empirical studies. The second most cited article in 2016 was “An update to systematic literature review”, cited by 154 different empirical published articles (27%). The third most cited article was “Mobile apps for science learning”, cited 83 times by the different empirical published articles (15%). The fourth most cited article published in 2016 was derived from CE which was “Virtual laboratories for education in science, technology, and engineering”, cited by 81 times by the different empirical published articles (14%). Finally, the fifth most cited article published in 2016 was derived from the journal of CE which was “Facebook and the others. Potentials and obstacles of Social Media for teaching in higher education” and cited by 78 different empirical studies (13%).

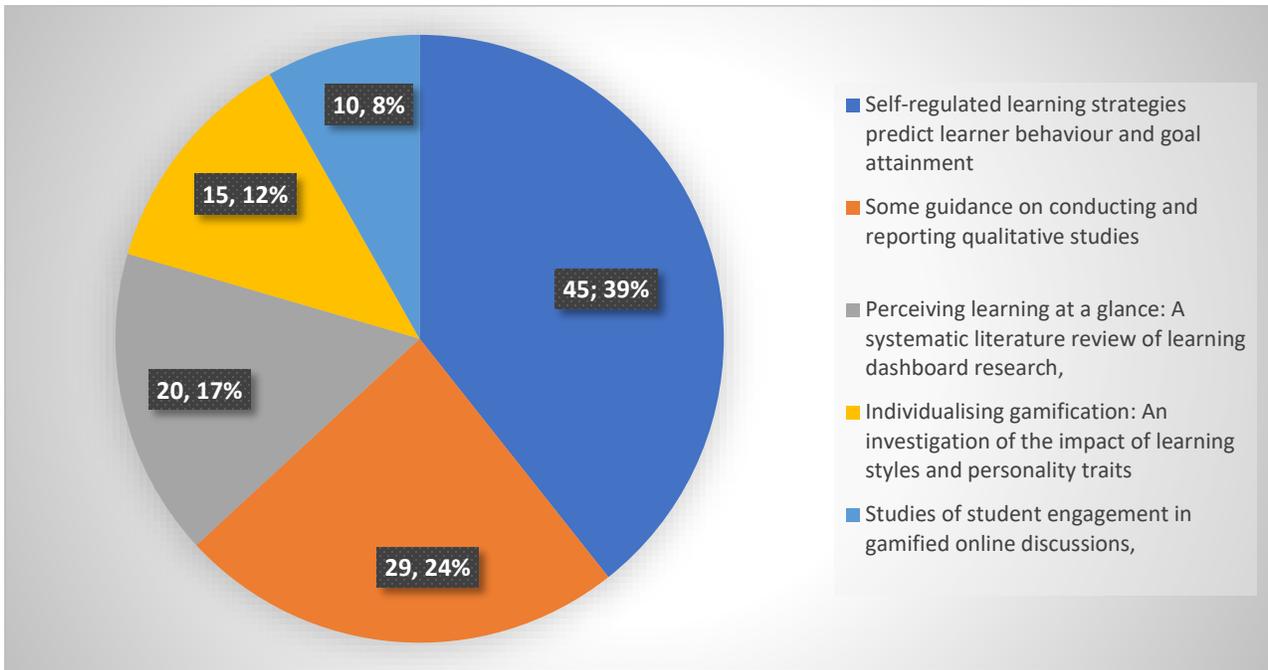


**Figure 10. Five most cited articles in 2016**

The Pie Chart in Figure 10 has presented the number of citation counts, covered percentage of each journal and the topic of each most cited articles published in 2016. Also in 2016 CE journal is dominating.

### 3.2.5 The five most cited published articles in 2017

The most cited article published in 2017 was “Self-regulated learning strategies predict learner behavior and goal attainment in Massive Open Online Courses”, derived from the journal of CE, cited 45 times by different empirical published articles (39%). The second most cited article, published in 2017 derived from the journal of CE was “Some guidance on conducting and reporting qualitative studies”, cited 29 times (24 %). Again, the third most cited article, published in 2017 derived from the journal of IEEE TLT was “Perceiving learning at a glance”, cited 20 times (17%). The fourth most cited published article in 2017 derived from the journal of CE was entitled the “Individualizing gamification: An investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market”, cited 15 times (12%). The fifth most cited paper, published in 2017 derived from the journal of CE was “Studies of student engagement in gamified online discussions”, cited 10 times (8%) (Ding, Kim & Orey, 2017).



**Figure 11. Five most cited articles in 2017**

The Pie Chart in Figure 11 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles published in the year 2017.

### **3.3 An overview of the most cited published articles per journal and per year**

Table 1 is the presentation of twenty-five most cited articles for per five selected journals (BJET, CE, CAL, IEEE TLT, and JETRD). Each journal has covered five most cited articles, its citation counts, types of per five selected journals. Moreover, Table 1 has also reflected the topics of the twenty-five most cited articles and year of publication of the articles. Table 1 importantly shows that three most cited articles were derived from the journal of CE, one most cited article was derived from JETRD, the next one most cited articles was derived from JCA, BJET and IEEE TLT do not belong the five most cited articles. Conversely, IEEE TLT and BJET have lesser number of citation counts than the journal of CE, CAL and JETRD. Similarly, Table 2 has presented the twenty-five most cited articles per year among the five selected journals and the published years of the twenty-five most cited articles where the beginning year was 2013 and the ending year was 2017 respectively. The topics and contents of the twenty-five articles are presented in Table 2 which are related to teaching pedagogy and activities of learning and teaching activities. The four most cited articles were derived from the year 2013 and one most cited article was derived from the year 2014.

Interestingly, three most cited articles of 2013 and one most cited articles were derived from the journal of CE and one was derived from journal of CAL.

**Table 1. Five most cited articles per journal based on Journal (Using Publish and Perish Tool).**

<b>British Journal of Educational Technology</b>	<b>Computer and Education</b>	<b>Journal of Computer Assisted Learning</b>	<b>IEEE transactions on learning technologies</b>	<b>Journal of educational technology research and development</b>
1.Putting twitter to the test: Assessing outcomes for student collaboration, engagement and success-259 times (2013)	1. Gamifying learning experiences: Practical implications and outcomes-801 times (2013).	1.Technological pedagogical content knowledge - A review of the literature 410 times (2013).	1. Developing into participants' profiles and use of social tools in MOOCs 54 times (2014)	1. Flipping the classroom and instructional technology integration in a college-level information system spreadsheet course-506 times (2013).
2.Mapping learning and game mechanics for serious games analysis-211 times (2015)	2.Current status, opportunities and challenges of augmented reality in education 606 times (2013).	2. Is it a tool suitable for learning? A critical review of the literature on Facebook as a technology-enhanced learning environment 263 times (2013).	2. Metafora: A web-based platform for learning to learn together in science and mathematics 52 times (2013)	2. Are badges useful in education? It depends upon the type of badge and expertise of learner-239 times (2013).
3. Critical success factors for transforming pedagogy with mobile Web 2.0 154 times (2015)	3. Assessing the effects of gamification in the classroom: - 352 times (2015)	3. Challenges to learning and schooling in the digital networked world of the 21st century 191 times (2013)	3. Providing collaborative support to virtual and remote laboratories 47 times (2013)	3. Instructor experiences with a social networking site in a higher education setting: expectations, frustrations, appropriation, and compartmentalization 97 times (2013).
4.Ethical and privacy principles for learning analytics-121 times (2014)	4. Here and now mobile learning: An experimental study on the use of mobile	4. A mixed methods assessment of students' flow experiences during a mobile	4. GreedEx: A visualization tool for experimentation and discovery	4. Enhancing socially shared regulation in collaborative learning groups: designing for CSCL regulation tools-89 times (2015).

	technology-329 times (2013).	augmented reality science game-126 times (2013).	learning of greedy algorithms 39 times (2013)	
5.The research and evaluation of serious games: Toward a comprehensive methodology-119 times (2014)	5.Instructional quality of Massive Open Online Courses (MOOCs) 300 times (2015)	5. Blending student technology experiences in formal and informal learning 108 times(2013)	5. Facilitating social collaboration in mobile cloud-based learning: A teamwork as a service (TaaS) approach 25 times (2014)	5. Improving learning achievements, motivations and problem-solving skills through a peer assessment-based game development approach 78 times (2014).

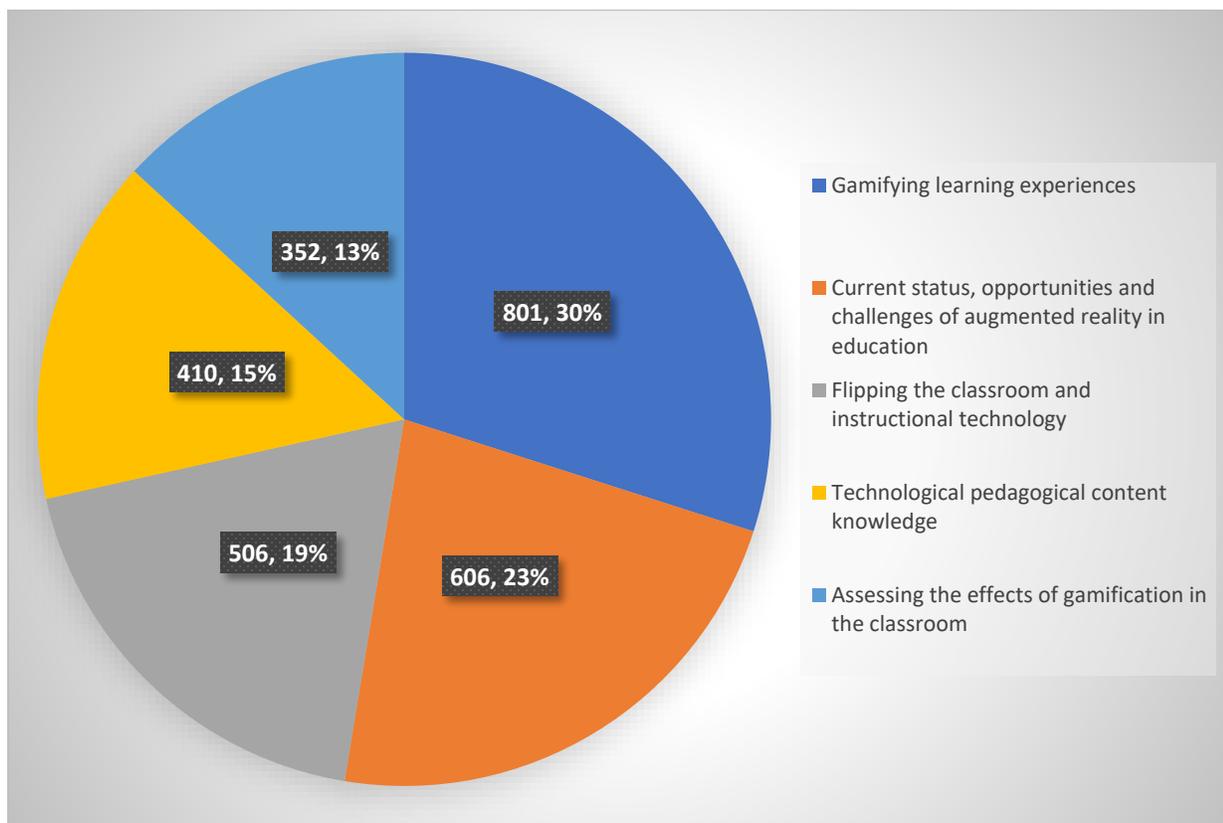
**Table 2. Five most cited articles per journal based on published year 2013-2017 (Using Publish and Perish Tool).**

2013	2014	2015	2016	2017
1. Gamifying learning experiences: Practical implications and outcomes, 801 times Computers & Education	1. Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis 273 times Computers & Education	1. Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance 352 times Computers & Education	1. The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis 167 times Computers & Education	1. Self-regulated learning strategies predict learner behavior and goal attainment in Massive Open Online Courses 45 times Computers & Education
2. Current status, opportunities and challenges of	2. It's not about seat time: Blending, flipping, and efficiency in active learning classrooms	2.Instructional quality of Massive Open Online Courses (MOOCs)	2. An update to the systematic literature review of empirical	2. Some guidance on conducting and reporting qualitative studies

augmented reality in education, 606 times Computers & Education	252 times Computers & Education	300 times Computers & Education	evidence of the impacts and outcomes of computer games and serious games 148 times Computers & Education	28 times Computers & Education
3. Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course, 506 times Educational Technology Research and Development	3. Students' perceptions of Facebook for academic purposes 231 times Computers and Education	3. Mapping learning and game mechanics for serious games analysis-211 times British Journal of Educational Technology	3. Mobile apps for science learning: Review of research 80 times Computers & Education	3. Perceiving learning at a glance: A systematic literature review of learning dashboard research 25 times IEEE Transactions on Learning Technologies
4. Technological pedagogical content knowledge - A review of the literature 410 times Journal of Computer Assisted Learning	4. Is FLIP enough? Or should we use the FLIPPED model instead? 203 times Computers and Education	4. Understanding the MOOCs continuance: The role of openness and reputation 156 times Computers & Education	4. Virtual laboratories for education in science, technology, and engineering: A review 77 times Computers & Education	4. Individualising gamification: An investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market 15 times Computers & Education
5. Here and now mobile learning: An experimental study on the use of mobile technology 329 times Computers & Education	5. Experimenting with electromagnetism using augmented reality: Impact on flow student experience and educational effectiveness 159 times Computers and Education	5. Critical success factors for transforming pedagogy with mobile Web 2.0 154 times British Journal of Educational Technology	5. Facebook and the others. Potentials and obstacles of Social Media for teaching in higher education 74 times Computers & Education	5. Studies of student engagement in gamified online discussions 10 times Computers & Education

### 3.3.1. The five most cited articles among all journals

The five most cited articles among all journals are “Gamifying learning experiences: Practical implications and outcomes”, “Current status, opportunities and challenges of augmented reality in education”, “Flipping the classroom and instructional technology integration in a college-level information system spreadsheet course”, “Technological pedagogical content knowledge” and “Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance” (see in Figure-11). The analysis covers the most cited five most cited articles and presented in the Pie Chart.

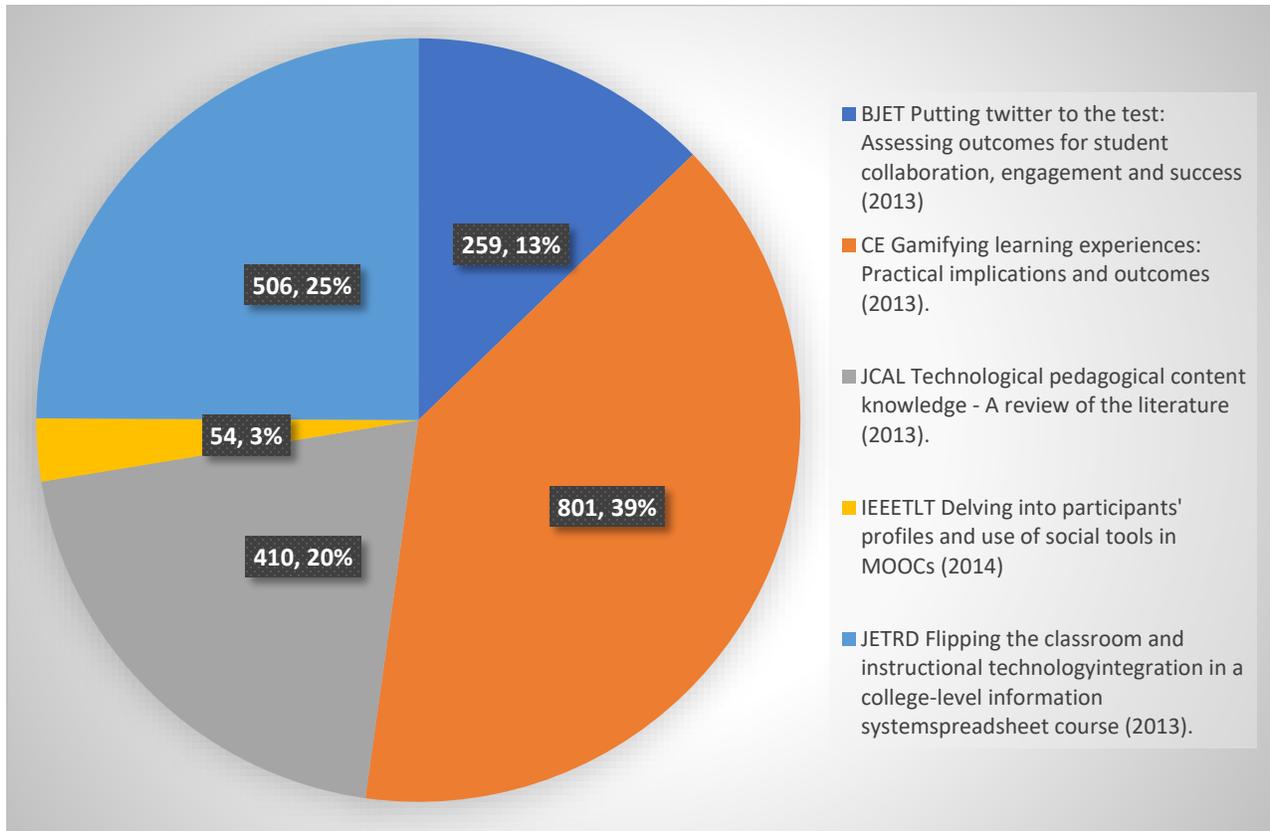


**Figure 12. The five most cited articles among all journals**

The Pie Chart in Figure 12 has presented the number of citation counts, covered percentage of each journal and the topic of each published most cited articles based on selected journals (see in Figure 12).

### 3.3.2 Analysis of the most cited published articles per journal

The titles of the five most cited articles according to each selected journals were “Gamifying learning experiences: Practical implications and outcomes”, “Current status, opportunities and challenges of augmented reality in education”, “Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course”, “Technological pedagogical content knowledge” and “Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance”.



**Figure 13. The most cited articles in each of the journals**

The Pie Chart in Figure 13 has presented the citation counts, citation percentage covered by each article and types of articles.

### 3.4 Analysis of the key words of most cited published articles on the basis of the journals

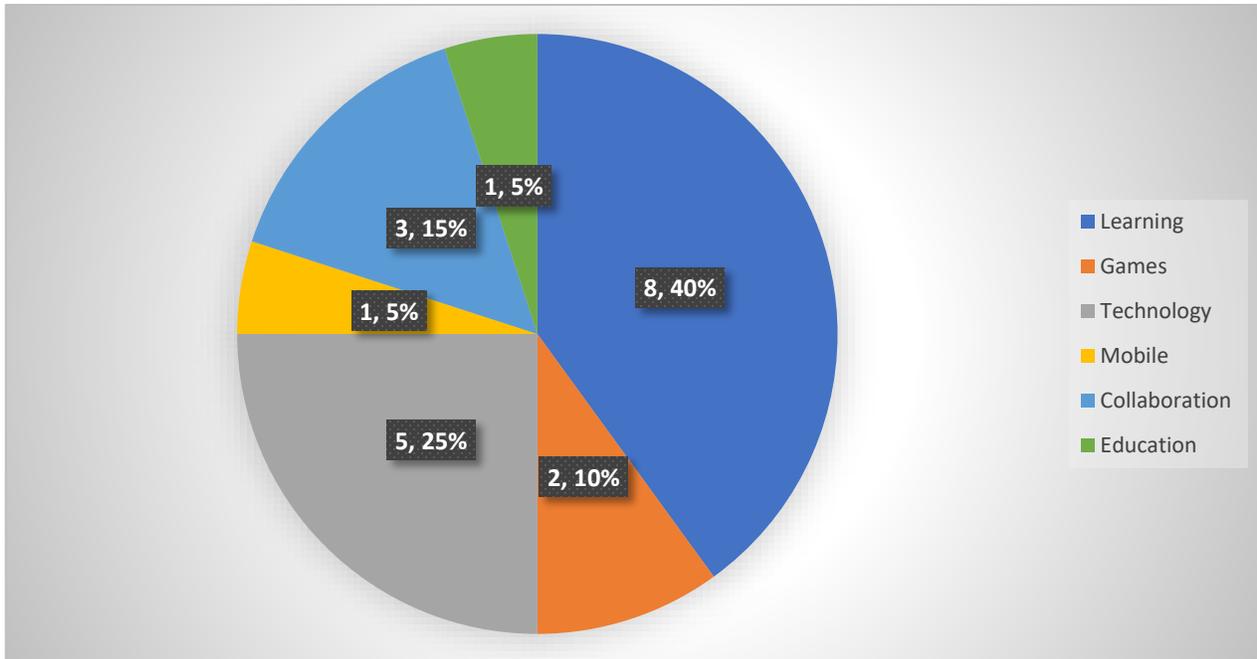
The current chapter has focused on the key words used in the selected forty-one most cited articles. The keywords are selected from the five selected journals. All the key words are initially selected and marked by different colours for the similarity.

**Table 3. Selected key words from per five selected journals**

S N	Types of journals	Key words	Repeat words counts
1	British Journal of Educational Technology	<p>Twitter, engagement, students, <b>education</b>, faculty, users, data, study, tweets, relationship, <b>collaboration</b>, <b>technology</b>, <b>design</b>, course, tweet, <b>Facebook</b>, research, <b>pedagogical</b>, learning, intervention, <b>information</b>, elements, analytics, serious games, <b>pedagogical</b>, <b>design</b>, <b>information</b>, <b>technology</b>, <b>learning</b>, <b>game-play</b>, supporting, entertainment, framework, goals, digital, knowledge, <b>contexts</b> machines, video <b>game</b>, addressing cognitive, social <b>processes</b>, practices, theoretical components, serious game mechanic, <b>game</b> <b>design</b>, <b>pattern</b>, <b>pedagogical</b>, <b>pattern</b>, <b>pedagogical</b> theories, <b>approaches</b>, experiential <b>learning</b> <b>education</b> philosophies, <b>game</b> <b>space</b>, visualization <b>space</b>, <b>elements</b> <b>space</b>, actor <b>space</b>, problem <b>space</b>, <b>feedback</b>, <b>elements</b>, analytics, <b>mobile</b> <b>learning</b> pilot studies, multiple <b>contexts</b>, cooperative, participatory, <b>design</b>, <b>pedagogical</b> transformation, integration, <b>approaches</b>, <b>technology</b>, interaction, <b>mobile</b> phone, earning <b>contexts</b>, <b>elements</b>, <b>mobile</b> devices, critical success factor, <b>practices</b> interaction, content, <b>collaboration</b> networking, <b>learning</b> environment, <b>Facebook</b>, <b>mobile</b> web 2.0 analytics, massive, <b>technology</b> <b>learning</b> <b>processes</b>, learners <b>information</b>, <b>learning</b> experience <b>context</b>, trust, accountability, transparency, pragmatic, <b>approaches</b>, <b>design</b>, <b>learning</b> ethical, privacy, communication, <b>design</b> devices, students, applications, interaction, assessment, techniques, instructors, privacy, <b>information</b>, analytics, <b>learning</b>, <b>game-based</b> <b>learning</b>, <b>game</b>, <b>approaches</b>, <b>design</b> <b>game</b> experience, <b>learning</b>, <b>feedback</b>, <b>learning</b> environment, <b>learning</b> satisfaction, <b>technology</b> <b>feedback</b></p>	<p>Learning-8 Games-6 Space-5 Pedagogical-5 Design-5 Technology-5 Information-4 Element-4 Approach-3 Mobile-3 Education-3 Contexts-3 Collaboration-3</p>
2	Computer and Education	<p>Gamification, games-based <b>learning</b>, computer <b>game</b>, <b>game</b> mechanic, <b>motivation</b>, engagement, <b>e-learning</b>, virtual reality, architectures for <b>education</b> <b>technology</b> system, virtual reality, improving classroom <b>teaching</b>, human-computer interface, interactive <b>learning</b> environments <b>teaching</b> strategies <b>educational</b> <b>technology</b> system, media in <b>education</b>, <b>teaching</b> and <b>learning</b> strategies, massive online open courses and distributed <b>learning</b> environments, <b>educational</b> tools, <b>collaborative</b> work, <b>mobile</b> support</p>	<p>Learning-5 Education-4 Teaching-3 Game-2 Technology-2 Collaborative-1 Mobile-1</p>

3	Computer Assisted Learning	Practicing teachers, strategies for <b>technology</b> integration, student teachers, teacher beliefs, <b>technological</b> knowledge, <b>technological pedagogical</b> content knowledge, cultural issue, <b>Facebook</b> implicit <b>pedagogies</b> , social networking sites, <b>technology</b> enhanced <b>learning</b> , 21 <sup>st</sup> century competencies, 21 <sup>st</sup> century <b>learning</b> , digital literacy, <b>mobile games</b> implementation augmented reality, engagement, flow, <b>game-based learning</b> , <b>mobile technology</b> , quick response codes and research synthesis, <b>collaboration</b> <b>Educational technology</b>	Technology-6 Learning-3 Pedagogy-2 Facebook-1 Game-1 Mobile-1 Collaboration-1 Education-1
4	IEEETLT	<b>Collaborative learning</b> , distance <b>learning</b> , computer and information science <b>education learning</b> via discovery, <b>education</b> simulations, social <b>learning</b> techniques, <b>collaborative learning tools</b> , knowledge sharing, peer tutoring, <b>learning</b> objects, <b>collaborative tools</b> , <b>educational technology</b> , E-learning, virtual and remote laboratories, computer science <b>education</b> , <b>learning</b> via discovery, user-centered <b>design</b> , visualization systems and software, <b>mobile</b> cloud, <b>collaborative learning</b> , <b>learning</b> flow, social computing, <b>learning</b> styles and task allocation. <b>mobile technology</b> <b>Collaborative learning design</b>	Learning-12 Collaborative-5 Education-4 Technology-2 Mobile-2 Design-2 Tools-2
5	Journal of Education Technology Research and Development	<b>Technology</b> integration, <b>technology</b> simulations, computer-aided <b>instruction</b> , differentiated instruction, badges, alternative assessment, <b>motivation</b> , intelligent tutors, Online social <b>network</b> , <b>learning</b> management system, Elgg, <b>instructor</b> experiences, <b>technology</b> integration, higher <b>education</b> , social <b>networking</b> sites, computer supported <b>collaborative learning</b> , <b>collaborative learning</b> , self-regulated <b>learning</b> , socially shared regulation of <b>learning</b> , <b>technological</b> tools, digital <b>game</b> -based <b>learning</b> , peer assessment, <b>learning motivation</b> , <b>learning</b> achievement and <b>game</b> development, <b>educational</b> tools, <b>mobile</b> <b>technology</b> <b>Collaborative</b> work.	Learning-8 Technology-5 Instruction-2 Collaborate-3 Game-2 Network-2 Motivation-2 Education-1 Mobile-1

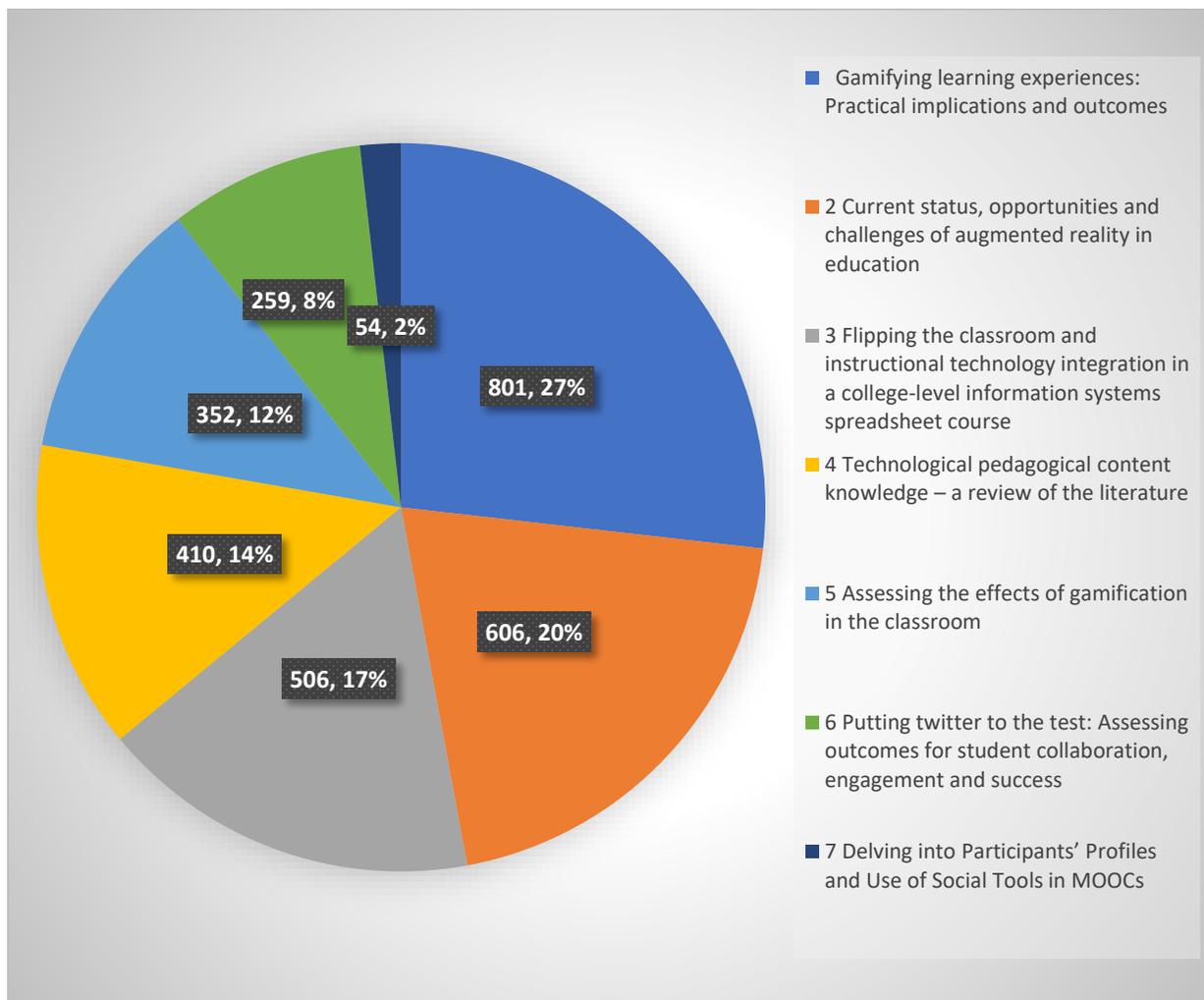
The most repeated key words in all 41 published journal articles were namely learning, game, mobile, technology, collaboration and education where the word “learning” (40%) has been used many times, the second mostly used key word was “technology” (25%), the third mostly used key word was “collaboration”(15%) the fourth mostly used key word in the 41 reviewed journal articles was “game”(10%) and the fifth and the sixth key words were mobile(5%) and education(5%). The word “learning” was used with different other words, for example, self-learning, online-learning and many others.



**Figure 14. Most repeated keywords from five journals.**

The Pie Chart in the Figure 14 has the most repeated keywords used in 41 published journal articles were learning, games, technology, mobile, collaboration and education. The word learning was the most repeated word in all reviewed 41 published journals articles which covers 40% of the whole key words used in the published journal articles. The second mostly repeated key word was technology which covers 25% of the whole key words used in 41 published journal articles. The third mostly repeated key words used in all published 41 journal articles is collaboration which covers 15% of the whole key words in 41 published journal articles. Similarly, the fourth mostly repeated key word was game in 41 published journal articles which covers 10% of the whole key words used in 41 published journal articles. The fifth mostly repeated key words of the 41 reviewed published journal articles were game and education which cover equal percentages (5%) of the total key used words in 41 published articles.

### 3.5. Detailed analysis of the seven most cited published articles per journal and per year



**Figure 15. Seven most cited published articles among five selected journals**

The Pie Chart in the Figure 15 has presented the number of citation counts, percentage covered by each article and title of each most cited article. The seven most cited articles were selected from both the five selected journals and per journals. The first most cited article was derived from the journal of CE which was “Gamifying learning experience: Practical implications and outcomes” cited 801 times (27%). The research objective was to increase students’ motivation and engagement in the use of game design elements and game mechanics in non-game contexts. Mixed method design was used in the research. The current researcher believes that using the mixed methods design was a rational decision of the authors because both qualitative and quantitative methods might have equal priority so that both methods can play an equally important role in addressing the research problem (Creswell and Plano Clark, 2007).

The article also describes augmented reality (AR) which is a crucial phenomenon of the current education era. The sample population of 357 students were asked the survey questionnaires to know their experiences, opinions and ideas of using the gamified version of the course. The article also contains open qualitative questions as the research instrument where 17 students were involved in the interviews to disclose their perceptions on using the gamified version of the course. The research findings were based on initial activity (5%), mid-term assignment (30%), final assignment (30%), final examination (30%), and participation (5%). The findings further note that students were initially motivated to participate in classroom activities but later they performed poorly on written assignments and participated less on class activities. The keywords used in the article were gamification, games-based learning, computer game, game mechanic, motivation, engagement and e-learning.

The second most cited published article was derived from CE which was “Current status, opportunities and challenges of augmented reality in education” cited by 606 times (20%). The abstract has covered the limited. The introduction section of the article has covered the definitions, taxonomies and technologies of augmented reality (AR) and also the issues of technological, pedagogical, and learning. The article is a review article. So, there was not a definite research design in this article. The abstract concluded that the instructional approach adopted by an AR system and the alignment among technology design, instructional method, and learning experiences would be more significant in educational technology. The research finding concluded that viewing AR as a concept rather than a type of technology would be more fruitful for educators, researchers, and designers. The findings also identified the features and affordances of AR systems and applications in teaching and learning activities (Wu et al., 2013; Goodier, 2018; Mckay, Sanko, Shekhter & Birnbach, 2014). Virtual reality and architectures for educational technology system were two key words used in the article. (Cohen et al., 2007).

The third most cited article was derived from JETRD which was “Flipping the classroom and instructional technology integration in a college-level information system spreadsheet course” cited by 506 times and has covered 17%. The purpose of the study was to investigate the effectiveness and feasibility of flipping a college course designed to teach introductory spreadsheet skill when compared to the traditional classroom approach. The first and second research questions were about the impact of instructional approach for the effectiveness of learning and the examination of

student's perception of a flipped approach relative to a traditional classroom approach. The research method was a post-test quasi-experimental research design with a cross-case comparative approach to the data analysis. Sample population of three hundred and one (N=301) students had taken part in the research study. Data analysis was also covered by the article where ANOVA was used to examine any statistically significant differences of variables. The research findings concluded that students using the Excel simulation approach were less likely to feel that they had learned a lot from the course and the flipped approach and simulation-based approach were both more instructionally efficient and scalable than the regular classroom approach for the Excel course studied (Davies et al., 2013, p.272). The article was suffered from the shortcomings. The first shortcoming was weak connection between research questions and research objectives. The second shortcoming was unclear research design. The keywords in the article were technology integration, technology simulations, computer-aided instructions, and differentiated instructions. The survey research design was used to examine effectiveness and feasibility of flipping a college course designed to teach introductory spreadsheet skills which could not deepen the knowledge of participants under the research phenomenon.

The fourth most cited article was derived from JCAL which was "Technological pedagogical content knowledge (TPACK)" and published in 2013, cited by 410 times (14%). The abstract reflected that the article was the literature review of 55 peer-reviewed journal articles with the purpose of reviewing article to examine the technological pedagogical content knowledge. The research method was review method for the further analysis. The issue is research instrument was also the content of the published article which was based on secondary data. The research findings concluded that there were different understandings of technological pedagogical content knowledge and of technological knowledge. An active involvement in redesign and representation of technology-enhanced lessons was found as a promising strategy for the development of technological pedagogical content knowledge in student teachers. Practicing teachers, strategies for technology integration, student teachers, teacher beliefs, technological knowledge and technological pedagogical content knowledge were recorded as key words in the article. In overall, the abstract of the article was ranked in average quality because limited information was mentioned in the abstract.

The keywords of the articles were cultural issue, Facebook, implicit pedagogies, social networking sites, technology-enhanced learning. The fifth most cited article was derived from CE which was "Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation,

social comparison, satisfaction, effort, and academic performance” which was cited 352 times (12%). The article was published in year 2015. The contents of the abstract were research theme which was gamification, the application of game elements to non-game settings, continues to grow in popularity as a method. The research objective was to increase student engagement in the classroom. The article has measured across two different courses in order to measure students’ motivation, social comparison, effort, satisfaction, learner empowerment, and academic performance at four points during a 16-week semester. The research method was longitudinal survey method. The sample population contained male 57 and female 23. The data analysis was based on descriptive statistics analysis where scale factor method was applied to find the values of Cronbach’s alpha which measured the reliability of the collected data. Chi-square was applied to find the relationship between independent and dependent variables. The descriptive statistics was applied to record the mean and standard deviation.

The research findings concluded that students in the gamified course showed less motivation, satisfaction, and empowerment over time than those in the non-gamified class. It was also found that the consequence of course category on students' final exam scores was facilitated by students' levels of intrinsic motivation. The findings also concluded that the gamified course showing less motivation and lower final exam scores than the non-gamified class with students. The keywords of the article were Virtual reality, improving classroom teaching, human-computer interface, interactive learning environments and teaching strategies. The sixth most cited article was derived from BJET which was “Putting twitter to the test: Assessing outcomes for student collaboration, engagement and success” which was cited 259 times (8%). The objective of the article was to analyse the relationships surrounding student engagement and collaboration as they intersect learning outcomes. Research methodology was mixed methods where the survey study and qualitative interview study were used as research method. The sample population of the study (sixth most cited article) had two types where 125 students were chosen for the type 1 study and 135 students were chosen for the type 2 research. The study 1 was related with students on Twitter in activities based on a *priori* theoretical model and study 2 was engagement of students sporadically on the platform. The research finding concluded that faculty involvement on the platform, combination of Twitter into the course grounded on a theoretically driven pedagogical prototypical and demanding student to use Twitter were important components of enhanced outcomes. The article has summarized that Twitter as a social media can assist collaboration, community building, participation, and sharing

experiences. It further concludes that educational technology has motivated the interest of higher education faculty students looking for ways to involve and attract the college students to be more energetic and motivated in learning activities (Junco, Heiberger & Loken, 2010). The sixth most cited article was free from the major shortcomings. The keywords of the article were group work in education engagement, success, postsecondary education, a mixed methods research, college teacher's online social networks, analysis of variance.

The seventh most cited article was "Delving into Participants' Profiles and Use of Social Tools in MOOCs" which was derived from IEEE TLT, cited 54 times (2%). The second research theme which was the massive open online courses. The article had discussed the participants' profiles on MOOCs, social tools on MOOCs and digital education of the future. The first research objective was to help MOOC teachers detect different types of participants and make informed choices when selecting social tools. The second objective was to examine in-depth empirical analysis of a nine-week MOOCs. The research method was based on reviewing of peer journals. The findings had concluded that massive open online courses were characterized by a large number of people enrolled in them and the performance of all performed people throughout the MOOC. The findings further concluded that MOOC was seen very diverse, and only a few students were able to manage to follow the course of MOOCs from beginning to end. Again, the results concluded that participants had used "Forum, Facebook, Twitter and MentorMob" were used as social media in MOOCs. The course had mainly focused on collaborative learning, distance learning and computer and information science education. The key words were collaborative learning, distance learning, computer and information science education. The primary shortcoming of the article was secondary data which has threaded the reliability and trustworthiness of the findings.

#### **4 DISCUSSION, RECOMMENDATIONS AND FUTURE WORK**

The results concluded that there were some similarities and contrasts in research objectives, research design, research instrument, research findings, published years, type of journals and key words used in the articles. The journal of CE looks more dominating among the most cited per selected journals and per year among the five selected journals which can also be supported by the fact that three out of the seven most cited articles were derived from CE. It was also noted that different types of research methods were used in the most cited seven articles, for example, a mixed methods design, review method, longitudinal survey method, the cross sectional survey method, qualitative interview method, and quantitative method. The most used research method in the seven most cited articles was review method. Meanwhile mixed method was seemed to be next popular research methods among the seven most cited published articles. It is found that the abstract of every most cited 7 articles were not self-elaborative. The first and sixth most cited articles had used the same research design and the same research instrument. Again, the first and the sixth most cited articles had used mixed method design and the survey questionnaire and qualitative semi- structured interview question as research design and research instrument. The first and the sixth most cited articles were published in 2013.

The next similarities between the third and the fifth most cited articles were the research method and research instrument used in the research articles because both research studies had used the quantitative research design as research method and the survey questionnaire as the research instrument. The second and the fourth most cited article had also the similarity of research method which was review method of the empirical journal articles. The results of the current study are not surprising because empirical research studies have also noted that the articles from the former years had higher number of citation counts. Conversely, published articles of the later years had least number of citations (Ivanović & Ho, 2017). The results further indicate that the least cited published article on the basis per five selected journals was derived from the Journal of IEEE TLT which was entitled the facilitating social collaboration in mobile cloud-based learning and cited 25 times. Similarly, the least cited journal based on per year among five selected journals was published in the year of 2017 which was entitled the studies of student engagement in gamified online discussions, cited 10 times. The review of forty-one most cited articles according to per five selected journals and per year among the five selected journals between 2013 to 2017 has highlighted the key results

in the field of educational technology research. The current study has supported the empirical studies of Abramovich, Schunn and Higashi (2013) because the study of Abramovich et al. (2013) had also concluded that the articles published in the former years had greater number of citation counts than articles published in the later years as the current study concluded. The current study has also identified that the current trends in education technology is highly connected with the computer and education in teaching activities because most of the published most cited published articles were derived from the journal of computer and education (n=21). All the keywords were arranged in the Table and then evaluated and compared one by one for the similarity and contrast. The key words were varied in forty-one published articles, but mostly common key words were only highlighted in the analysis section. Then the key words were then compared with forty-one published selected articles. Six mostly repeated keywords from forty-one published articles were identified as learning, technology, collaboration, game, mobile and education. Furthermore, the current study signifies that the trends of current educational technology research has focused on computer and education technology. Finally, the current study also found that most of the repeated published articles were also derived from the journal of computer and education.

The current researcher had faced many difficulties during this study, for example, finding the most cited articles because there was variation in the citation counts among different online sources. Some online sites showed greater number of citation counts and some online resources showed lesser number of citation counts. The next limitation of the current study is the analysis of the limited number of most cited articles because the current study had reviewed only forty-one most cited articles. So, the findings cannot be generalized for the larger sample size. The next implication of the this study is the limited analysis of characteristics of the forty-one most cited articles because the current study has analyzed articles based on per year among the five selected journals and per five selected journals. The current researcher has also realized that the findings would be more valid and reliable if the greater number of the most cited articles had been selected and added in the analysis section. Again, it was further reflected that reviewing most cited articles can give more depth knowledge to select future research topics and also helpful to know the current trends of educational technology research. The most crucial reflection for the current researcher was embedded in knowing the emerging issues of educational technology to integrate in teaching and learning activities for improving the quality of education and students' performance.

It is recommended that the educational technology research of CE is emerging in educational institutions so the future research needs to focus on reviewing the most cited articles on the journal of CE because reviewing the greater number of the most cited articles give more depth knowledge to conduct and address the contemporary issues of educational technology for the educational practitioners. The future research has also to focus on reviewing the most cited articles of longitudinal studies which would give more citation counts and reflect more advanced knowledge of educational technology for the novice researchers. The findings further suggest that the future researchers need to focus on reviewing the greater number of the most cited journals of CE separately to foreground the specific knowledge of educational technology so that it would give innovative and contemporary knowledge of educational technology and computer education. If the future research focuses on reviewing the most cited articles of per selected five journals, it would be more beneficial for practitioners, school leaders and the different levels teachers to gain more knowledge how to intergrade computer technology in classroom teaching.

More importantly, the future research needs to focus on reviewing the articles of the former years which would give more citation counts and empirical knowledge for conducting the future primary research. The future research also has to select the most cited published article of per five selected articles and needs to review them separately so that it can help the future researchers to know the special issues of each journal and to conduct primary research on educational technology, for example, BJET, CE, JCAL, IEEE TLT, JETRD. Finally, in order to generalize the results obtained in this study, similar analysis of the most cited articles per five journals and per year among the five selected journals should be made on reviewing most cited published articles on five per selected journals and per year among the five selected journals between 2013 to 2017.

## REFERENCES

- Abramovich, S., Schunn, C. and Higashi, R. (2013). Are badges useful in education? It depends upon the type of badge and expertise of learner. *Educational Technology Research and Development*, 61(2), pp.217-232.
- Ahuja, S. and Muthiah, K. (2016). Survey of state-of-art in green cloud computing. *International Journal of Green Computing*, 7(1), pp.25-36.
- Aksnes, D. (2003). Characteristics of most cited articles. *Research Evaluation*, 12(3), 159-170.
- Alario-Hoyos, C., Perez-Sanagustin, M., Delgado-Kloos, C., Parada G, H. and Munoz-Organero, M. (2014). Delving into participants' profiles and use of social tools in MOOCs. *IEEE Transactions on Learning Technologies*, 7(3), pp.260-266.
- Alexander, M. (2018). The flipped classroom: engaging the student in active learning. *Journal of Legal Studies Education*, 35(2), 277-300
- Alraimi, K., Zo, H. and Ciganek, A. (2015). Understanding the MOOCs continuance: The role of openness and reputation. *Computers & Education*, 80, pp.28-38
- Antonenko, P., Dawson, K., and Sahay, S. (2016). A framework for aligning needs, abilities and affordances to inform design and practice of educational technologies. *British Journal of Educational Technology*, 48(4), 916-927.
- Arnab, S., Lim, T., Carvalho, M., Bellotti, F., de Freitas, S., Louchart, S., Suttie, N., Berta, R. and De Gloria, A. (2014). Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology*, 46(2), pp.391-411.
- Arteaga Sánchez, R., Cortijo, V. and Javed, U. (2014). Students' perceptions of Facebook for academic purposes. *Computers & Education*, 70, pp.138-149.
- Baepler, P., Walker, J. and Driessen, M. (2014). It's not about seat time: Blending, flipping, and efficiency in active learning classrooms. *Computers & Education*, 78, pp.227-236.
- Bergbom, I. and Lepp, M. (2010). Reviewing and writing articles for SCS. *Scandinavian Journal of Caring Sciences*, 24(1), pp.1-2.
- Boyle, E., Hainey, T., Connolly, T., Gray, G., Earp, J., Ott, M., Lim, T., Ninaus, M., Ribeiro, C. and Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education*, 94, pp.178-192.
- Bressler, D. and Bodzin, A. (2013). A mixed methods assessment of students' flow experiences during a mobile augmented reality science game. *Journal of Computer Assisted Learning*, 29(6), pp.505-517.
- British Journal of Educational Technology. (2018). Retrieved from <https://www.scimagojr.com>.

- Brun, M., & Hinostroza, J. E. (2014). Learning to become a teacher in the 21st century: ICT integration in Initial Teacher Education in Chile. *Educational Technology & Society*, 17, 222-238.
- Buckley, P. and Doyle, E. (2017). Individualising gamification: An investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market. *Computers & Education*, 106, pp.43-55.
- Carvalho, M., Bellotti, F., Berta, R., De Gloria, A., Sedano, C., Hauge, J., Hu, J. and Rutenberg, M. (2015). An activity theory-based model for serious games analysis and conceptual design. *Computers & Education*, 87, pp.166-181.
- Chen, Y., Wang, Y., Kinshuk and Chen, N. (2014). Is FLIP enough? Or should we use the FLIPPED model instead? *Computers & Education*, 79, pp.16-27.
- Christensen, R., Eichhorn, K., Prestridge, S., Petko, D., Sligte, H., & Baker, R. et al. (2018). Supporting learning leaders for the effective integration of technology into schools. *Technology, Knowledge and Learning*, 23(3), 457-472.
- Cochrane, T. (2013). Critical success factors for transforming pedagogy with mobile Web 2.0. *British Journal of Educational Technology*, 45(1), pp.65-82.
- Creswell, J., & Plano Clark, V. (2011). *Designing and conducting mixed methods research* (1st ed.). Thousand Oaks: Sage.
- Creswell, J. (2017). *Designing & Conducting Mixed Methods Research + The Mixed Methods Reader*. [S.L.]: Sage Publications.
- Cuny, J. (2011). Transforming computer science education in high schools. *Computer*, 44(6), 107-109.
- Daldrup-Link, DE (2018). Writing a review article - Are you making these mistakes? *Nanotheranostics*; 2:2,197-200.
- Davies, R., Dean, D. and Ball, N. (2013). Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course. *Educational Technology Research and Development*, 61(4), pp.563-580.
- De la Torre, L., Heradio, R., Jara, C., Sanchez, J., Dormido, S., Torres, F. and Candelas, F. (2013). Providing collaborative support to virtual and remote laboratories. *IEEE Transactions on Learning Technologies*, 6(4), pp.312-323.
- Ding, L., Kim, C. and Orey, M. (2017). Studies of student engagement in gamified online discussions. *Computers & Education*, 115, pp.126-142.
- Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C. and Martínez-Herráiz, J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education*, 63, pp.380-392.

- Donovan, S. (2007). Writing and presenting research (review). *Journal of Scholarly Publishing*, 38(3), pp.179-182.
- Dragon, T., Mavrikis, M., McLaren, B., Harrer, A., Kynigos, C., Wegerif, R., & Yang (2013). Metafora: A web-based platform for learning to learn together in science and mathematics. *IEEE Transactions on Learning Technologies*, 6(3), 197-207.
- Eisenhower National Clearinghouse for Mathematics and Science Education. (1999). *Integrating technology in the classroom*. [Columbus, OH].
- Erkollar, A, (2013). Putting google+ to the test: assessing outcomes for student collaboration, engagement and success in higher education. *Procedia - Social and Behavioral Sciences*, 83; 185-189.
- Ghavifekr, S, Zabidi Abd Razak, A, Faizal A, M, Ng Yan Ran, G, Meixi, Y & Tengyue, Z (2014). ICT Integration in Education: Incorporation for Teaching & Learning Improvement Simin Ghavifekr, Ahmad Zabidi. *The Malaysian Online Journal of Educational Technology*; 2:2, 1-22
- Goodier, S. (2018). Evaluating the network: A workflow for tracking twitter interactions using social networking analysis. *Journal of Interactive Media in Education*, 2018(1), 2.
- Greg Kipper. Joseph Rampolla. (2013). *Augmented Reality: An Emerging Technologies Guide to AR*. Syngress.
- Gupta, D. (2015). Teacher education curriculum in context of information & communication technology. *Issues and Ideas in Education*, 3(2), 85-101
- Hanus, M. and Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education*, 80, pp.152-161.
- Hwang, G., Hung, C. and Chen, N. (2013). Improving learning achievements, motivations and problem-solving skills through a peer assessment-based game development approach. *Educational Technology Research and Development*, 62(2), pp.129-145.
- Ibáñez, M., Di Serio, Á. Villarán, D. and Delgado Kloos, C. (2014). Experimenting with electromagnetism using augmented reality: Impact on flow student experience and educational effectiveness. *Computers & Education*, 71, pp.1-13.
- Innovation in technologies for educational computing. (2016). *IEEE Transactions on Learning Technologies*, 9(1), 96-96.
- Ivanović, L., & Ho, Y. (2017). Most cited articles in the Education and Educational Research category in the Social Science Citation Index: a bibliometric analysis. *Educational Review*, 1-10. doi: 10.1080/00131911.2017.1415297.

- Jacobsen, M. (2010). Editorial: defining the field of educational technology. *Canadian Journal of Learning and Technology / La Revue Canadienne De L'Apprentissage Et De La Technologie*, 35(2).
- Januszewski, A. (2001). *Educational technology*. Englewood, Colo.: Libraries Unlimited.
- Järvelä, S., Kirschner, P., Panadero, E., Malmberg, J., Phielix, C., Jaspers, J., Koivuniemi, M. and Järvenoja, H. (2014). Enhancing socially shared regulation in collaborative learning groups: designing for CSCL regulation tools. *Educational Technology Research and Development*, 63(1), pp.125-142.
- Jarvinen, P. (1998). Reviewing articles as a tool for learning. *AI & Society*, 12(4), pp.346-350.
- Junco, R., Elavsky, C. and Heiberger, G. (2013). Putting twitter to the test: Assessing outcomes for student collaboration, engagement and success. *British Journal of Educational Technology*, 44(2), pp.273-287.
- Kizilcec, R., Pérez-Sanagustín, M. and Maldonado, J. (2017). Self-regulated learning strategies predict learner behavior and goal attainment in Massive Open Online Courses. *Computers & Education*, 104, pp.18-33.
- Lai, K., Khaddage, F. and Knezek, G. (2013). Blending student technology experiences in formal and informal learning. *Journal of Computer Assisted Learning*, 29(5), pp.414-425.
- Manca, S. and Ranieri, M. (2013). Is it a tool suitable for learning? A critical review of the literature on Facebook as a technology-enhanced learning environment. *Journal of Computer Assisted Learning*, 29(6), pp.487-504.
- Manca, S. and Ranieri, M. (2016). Facebook and the others. Potentials and obstacles of Social Media for teaching in higher education. *Computers & Education*, 95, pp.216-230.
- Margaryan, A., Bianco, M. and Littlejohn, A. (2015). Instructional quality of Massive Open Online Courses (MOOCs). *Computers & Education*, 80, pp.77-83.
- Martin, F. and Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers & Education*, 68, pp.76-85.
- Mayer, I., Bekebrede, G., Harteveld, C., Warmelink, H., Zhou, Q., van Ruijven, T., Lo, J., Kortmann, R. and Wenzler, I. (2013). The research and evaluation of serious games: Toward a comprehensive methodology. *British Journal of Educational Technology*, 45(3), pp.502-527.
- Merchant, Z., Goetz, E., Cifuentes, L., Keeney-Kennicutt, W. and Davis, T. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education*, 70, pp.29-40.
- Novikoff, TP, (2012). Education of a model student. *PNAS*, 109:6, 1868–1873
- Onifade, A. (2011). The third millennium secretary and information & communication technology: nigerian experience. *International Journal of Management & Information Systems (IJMIS)*, 13(2), 39.

- Pardo, A. and Siemens, G. (2014). Ethical and privacy principles for learning analytics. *British Journal of Educational Technology*, 45(3), pp.438-450.
- Pathek, R., & Chaudhay, J. (2012). *Educational technology*. New Delhi: Dorling Kindersley.
- Peters, L. (2009). *Global Education; Using Technology to bring the world to out students*, International Society for Technology in Education; Retrieved from <https://books.google.com.np>.
- Picatoste, J., Pérez-Ortiz, L., & Ruesga-Benito, S. (2018). A new educational pattern in response to new technologies and sustainable development. Enlightening ICT skills for youth employability in the European Union. *Telematics and Informatics*, 35(4), 1031-1038.
- Potkonjak, V., Gardner, M., Callaghan, V., Mattila, P., Guetl, C., Petrović, V. and Jovanović, K. (2016). Virtual laboratories for education in science, technology, and engineering: A review. *Computers & Education*, 95, pp.309-327.
- Putnam, R., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher*, 29(1), 4-15.
- Robins, A. (2015). The ongoing challenges of computer science education research. *Computer Science Education*, 25(2), 115-119.
- Schwendimann, B., Rodriguez-Triana, M., Vozniuk, A., Prieto, L., Boroujeni, M., Holzer, A., Gillet, D. and Dillenbourg, P. (2017). Perceiving learning at a glance: a systematic literature review of learning dashboard research. *IEEE Transactions on Learning Technologies*, 10(1), pp.30-41.
- Spector, J. (2015). *Foundations of educational technology*.
- Spector, J. (2017). Reflections on educational technology research and development. *Educational Technology Research and Development*, 65(6), pp.1415-1423.
- Sun, G. and Shen, J. (2014). Facilitating social collaboration in mobile cloud-based learning: A teamwork as a service (TaaS) approach. *IEEE Transactions on Learning Technologies*, 7(3), pp.207-220.
- Sung, H. and Hwang, G. (2013). A collaborative game-based learning approach to improving students' learning performance in science courses. *Computers & Education*, 63, pp.43-51.
- Sung, Y., Chang, K. and Liu, T. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education*, 94, pp.252-275.
- Topîrceanu, A. (2017). Gamified learning: A role-playing approach to increase student in-class motivation. *Procedia Computer Science*, 112, pp.41-50.
- Twining, P., Heller, R., Nussbaum, M. and Tsai, C. (2017). Some guidance on conducting and reporting qualitative studies. *Computers & Education*, 106, pp. A1-A9.

- Van Thiel, L. (2018). Professional learning design framework: supporting technology integration in Alberta. *Research in Learning Technology*, 26(0).
- Velazquez-Iturbide, J., Debdi, O., Esteban-Sanchez, N. and Pizarro, C. (2013). GreedEx: A visualization tool for experimentation and discovery learning of greedy algorithms. *IEEE Transactions on Learning Technologies*, 6(2), pp.130-143.
- Veletsianos, G., Kimmons, R. and French, K. (2013). Instructor experiences with a social networking site in a higher education setting: expectations, frustrations, appropriation, and compartmentalization. *Educational Technology Research and Development*, 61(2), pp.255-278.
- Voogt, J., Erstad, O., Dede, C. and Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of Computer Assisted Learning*, 29(5), pp.403-413.
- Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J. and van Braak, J. (2012). Technological pedagogical content knowledge - a review of the literature. *Journal of Computer Assisted Learning*, 29(2), pp.109-121.
- Williams, P. (2012). *Technology Education for Teachers*. Rotterdam: Sense Publishers.
- Wu, H., Lee, S., Chang, H. and Liang, J. (2013). Current status, opportunities and challenges of augmented reality in education. *Computers & Education*, 62, pp.41-49.
- Zohrabi, M. (2013). Mixed method research: instruments, validity, reliability and reporting findings. *Theory and Practice in Language Studies*, 3(2), 254-262
- Zydney, J. and Warner, Z. (2016). Mobile apps for science learning: Review of research. *Computers & Education*, 94, pp.1-17.

## Appendix 1

**Table 1: Research types and Subjects of most cited articles**

SNO	Research topics	Published year	Subject of journal	Research types	Subject terms
1.	Putting twitter to the test: Assessing outcomes for student collaboration, engagement and success.	2013	BJET	Article	1.group work in education engagement, (philosophy), success, postsecondary education, a mixed methods research, college teachers online social networks, analysis of variance
2.	Mapping Learning and Game Mechanics for Serious Games Analysis	2015	BJET	Peer review	2. Instructional, Serious Games (SGs), methodologies, tools, assessment. Games and Learning Alliance, Serious Games (SGs), pedagogy-Fundamental, design, translation, learning, mechanical instructional, Learning Mechanics-Game Mechanics, pedagogical, game, design, educational settings, Frameworks
3.	Critical success factors for transforming pedagogy with mobile Web 2.0	2015	BJET	Article	3. mobile learning, web 2.0, educational technology research, web-based instruction, communities of practice, teaching methods research, higher education.
4	Ethical and privacy principles for learning analytics	2014	BJET	Article	4. educational technology, learning, analytical entry (cataloging), trust, transparency in organizations, organizational accountability, privacy moral & ethical aspects great Britain
5	The research and evaluation of serious games: Toward a comprehensive methodology.	2014	BJET	Article	5. <i>(digital) Game-Based Learning (GBL), Serious Games, Simulation-Gaming</i> , The research design, scientific evaluation, computer-based simulation games (SGs), advanced learning, comprehensive, technology, education, scientific methodology, evaluation, learning, systematically, instruments, education, technology
6.	Gamifying learning experiences: Practical implications and outcomes.	2013	CE	Article	6. Gamification, Games-based learning, Computer game, Game mechanic Motivation. Engagement, e-learning
7.	Current status, opportunities and challenges of augmented reality in education	2013	CE	Article	7. augmented reality, classroom environment, educational technology -- evaluation, learning, , cognitive analysis.
8.	Assessing the effects of gamification in the classroom.	2015	CE	Article	8. Improving classroom teaching Interactive learning environments Teaching strategies, Virtual reality
9.	Here and now mobile learning.	2013	CE	Article	9. Media in education,, Teaching/learning strategies, Elementary education,

					Interactive learning environments Teaching/learning strategies
10.	Instructional quality of Massive Open Online Courses (MOOCs)	2015	CE	A review article	10. Instructional, design quality, randomly, Massive, Courses (MOOCs), instruction, Instrument, instructional design quality was assessed and compared, organisation and Presentation, technology, mobile, education, Implications.
11.	Technological pedagogical content knowledge – a review of the literature.	2013	CAL	A review article	11. Cultural issue, Facebook, implicit pedagogies, social networking sites, technology-enhanced learning.
12	Is it a tool suitable for learning?	2013	CAL	Special issue	12. Facebook, social networking sites, technology-enhanced learning, implicit pedagogies, cultural issue
13	Challenges to learning and schooling in the digital networked world of the 21st century	2013	CAL	Article	13. 21st century competencies, 21st century learning, digital literacy, implementation, research synthesis.
14.	A mixed methods assessment of students' flow experiences during a mobile augmented reality, science game	2013	CAL	Special issue	14. augmented reality, engagement, flow, game-based learning, mobile technology, Quick Response codes.
15	Blending student technology experiences in formal and informal learning	2013	CAL	Article	15. ICT and pedagogy, informal learning, learning ecology, mobile technologies
16	Delving into Participants' Profiles and Use of Social Tools in MOOCs.	2014	IEEE TLT	Article	16. Collaborative learning, distance learning, computer and information science education
17	Metafora: A Web-Based Platform for Learning to Learn Together in Science and Mathematics	2013	IEEE TLT	Article	17. Planning,, Reflection,, Context,, Mathematics,, Collaboration,, Collaborative work,, Software,, learning objects, Learning via discovery, educational simulations,, social learning techniques,, collaborative learning tools,, sharing, peer
18	Providing Collaborative Support to Virtual and Remote Laboratories	2013	IEEE TLT	Article	18. Learning via discovery, educational simulations, social learning techniques, collaborative learning tools, knowledge sharing, peer tutoring, learning objects
19	GreedEx: A Visualization Tool for Experimentation and Discovery Learning of Greedy Algorithms	2013	IEEE TLT	Article	19. Collaborative learning tools, educational technology, e-learning, virtual and remote laboratories
20	Facilitating Social Collaboration in Mobile Cloud-Based Learning: A	2014	IEEE TLT	Article	20. Teamwork, Mobile communication, Social computing, Virtual groups, Context

	Teamwork as a Service (TaaS) Approach				
21	Flipping the classroom and instructional technology integration in a college-level information system spreadsheet course	2013	JETRD	Article	21. Technology integration Technology simulations Computer-aided instruction Differentiated instruction
22	Are badges useful in education? it depends upon the type of badge and expertise of learner	2013	JETRD	Article	22. Badges Alternative assessment Motivation Intelligent tutors.
23	Instructor experiences with a social networking site in a higher education setting: expectations, frustrations, appropriation, and compartmentalization	2013	JETRD	Article	23 Online social network Learning management system Elgg Instructor experiences Technology integration Higher education Social networking site
24	Enhancing socially shared regulation in collaborative learning groups: designing for CSCL regulation tools	2015	JETRD	Article	24. Computer supported collaborative learning Collaborative learning Self-regulated learning Socially shared regulation of learning Technological tools, computer-mediated communication; to-face groups; environments; students; knowledge; motivation; participation; metaanalysis; performance; technology
25	Improving learning achievements, motivations and problem-solving skills through a peer assessment-based game development approach	2014	JETRD	Article	25 Digital game-based learning Peer assessment Learning motivation Learning achievement Game development
26	Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education	2014	CE	Article	27. Simulations Games. Virtual worlds, Students learning, outcomes, Meta-analysis
27	It's not about seat: blending, flipping...	2014	CE	Article	28. ICT and pedagogy, informal learning, learning ecology, mobile technologies
28	Students' perceptions of Facebook for academic purposes	2014	CE	Article	29. Diffusion of innovation University, Educational context
29	Is FLIP enough? Or should we use the FLIPPED model instead?	2014	CE	Article	30. Pedagogical issues, Teaching/learning strategies, Distributed learning environments, Interactive learning environments, Improving classroom teaching
30	Experimenting with electromagnetism using augmented reality: Impact on flow student experience and educational effectiveness	2014	CE	Article	31. Secondary education, Simulations, Interactive learning, environments, Applications in subject areas, Augmented reality

31	Understanding the MOOCs continuance: The role of openness and reputation	2015	CE	Article	33. Massive Open Online Courses (MOOCs), Openness, Reputation, Motivation, Continuance
32	The effects of integrating mobile devices with teaching and learning on students' learning performance A meta-analysis and research synthesis.	2016	CE	Review article	36. Pedagogical issues, Teaching/learning strategies
33	An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games	2016	CE	Review article	37. Computer games, Serious games Entertainment, Engagement Learning, Systematic literature review
34.	Mobile apps for science learning: Review of research	2016	CE	Article	38. Applications in science education, Mobile learning, Interactive learning environments Cooperative/collaborative learning
35	Virtual laboratories for education in science, technology, and engineering: A review	2016	CE	Article	39. Virtual laboratory, Dynamics based virtual reality, Virtual world, Distance learning for engineering/STEM education, Immersive education
36	Facebook and the others. Potentials and obstacles of Social Media for teaching in higher education	2016	CE	Article	40. Social Media, Higher education, Teaching, Potential, Obstacle
37	Self-regulated learning strategies predict learner behavior and goal attainment in Massive Open Online Courses	2017	CE	Review article	41. Online learning, Learning analytics, Individual differences, Self-regulated learning, Massive open online course
38	Some guidance on conducting and reporting qualitative studies	2017	CE	Article	42. Qualitative, Quantitative Research, Guidelines, Theoretical stance
39	Perceiving Learning at a Glance: A Systematic; Literature Review of Learning Dashboard Research	2017	IEEE TLT	Article	43. Learning analytics, educational data mining, information visualization, dashboards, systematic review
40	Individualizing gamification: An investigation of the impact of learning styles and personality traits on the efficacy of gamification using a prediction market	2017	CE	Article	44. Gamification, Learning styles, Personality traits, Millennials, Prediction markets, Higher level pedagogy
41	Studies of student engagement in gamified online discussions	2017	CE	Article	45. Gamification, Student engagement Online discussion, gEchoLu